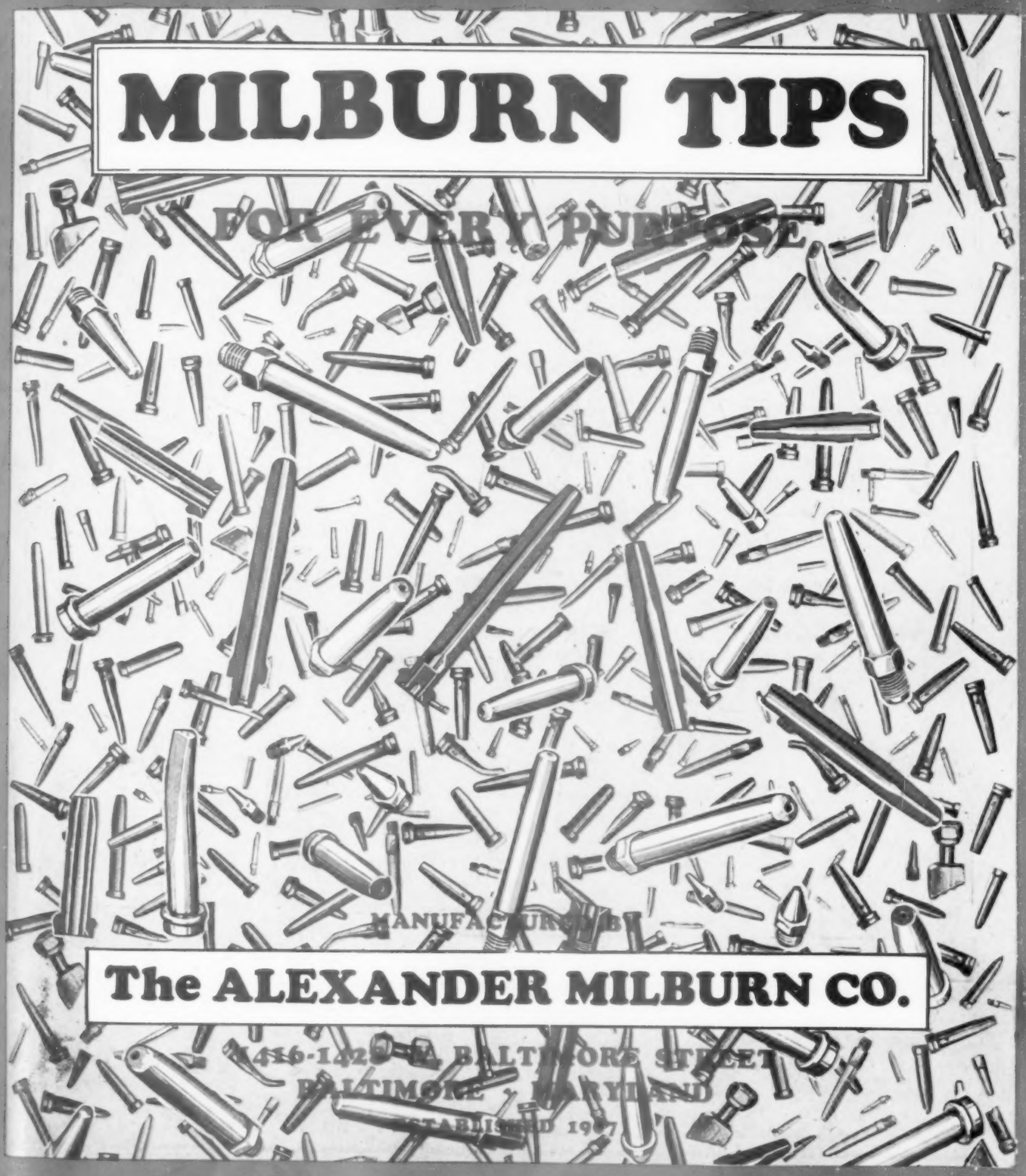
The Welding Engineer

Reg. U. S. Pat. Office

Founded by L. B. Mackenzie, 1916

SEPTEMBER, 1929 VOL. 14, NO. 9

$3.00 per year in U. S. 608 S. Dearborn St., Chicago, Ill. $4.00 per year abroad



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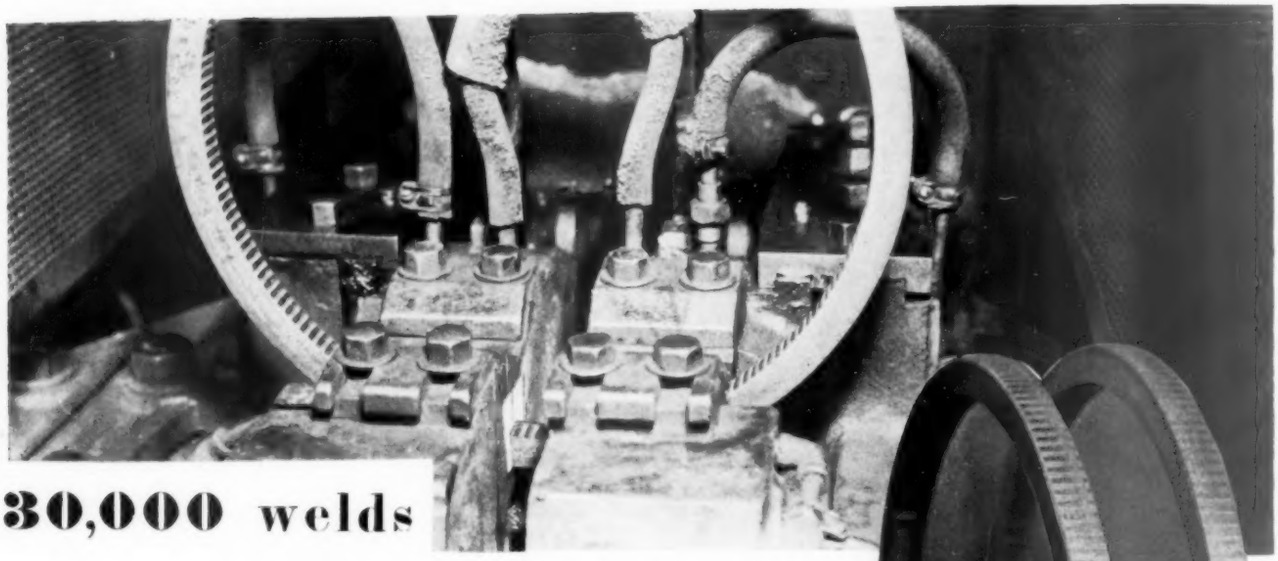
Flash Welding Flywheel Ring Gears



30,000 welds per set of *ELKONITE* Dies

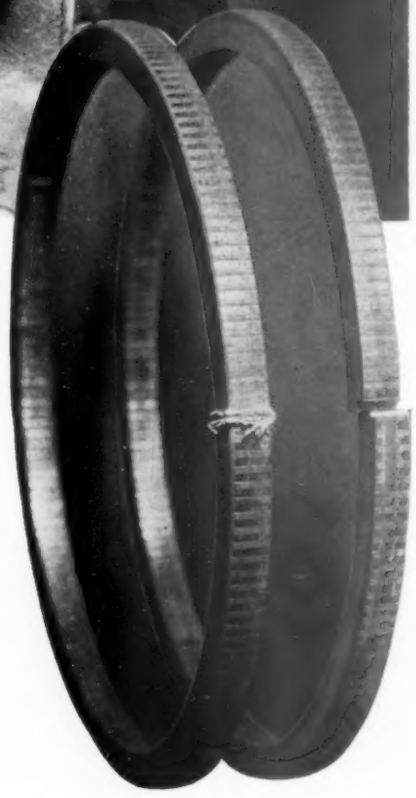
THIS particular application of resistance welding with *ELKONITE* is in successful use by one manufacturer of a well-known, higher-priced car.*

In flash welding the flywheel ring gear, the *ELKONITE* dies stand up for approximately 30,000 welds, make a *better* weld with *less shrinkage* and speed up production because they require less redressing! Copper on this job lasted for about 1500 welds. A comparison of these figures, which have been selected as typical of *ELKONITE* performance, indicates the superiority of *ELKONITE* dies and electrodes. They have proven not only better for all general welding purposes but through their use many new welding applications are now commercially practical.

The application shown here and many others—some no doubt paralleling your own resistance welding problems—are described in our booklet, "Elkonite Die and Electrode Applications in Resistance Welding." This will be sent upon request—without obligation, of course.

ELKON, Inc., *ELKONITE* Dept.
Division of P. R. Mallory & Co., Inc.
Indianapolis, Ind.

* *Name on request*



The flywheel ring gear before and after the *ELKONITE* weld. Note the thickness of the metal welded. The *ELKONITE* dies may be seen surrounding the ring gear in the top illustration. The light section of the die is *ELKONITE*.

Exclusive Licensees Under General Electric Co. Patents Dated May 28, 1925, and September 1, 1925. Other Patents Pending to Elkon, Inc.

ELKONITE

REG. U.S. PAT. OFF.

Chicago, Ill., under the Act of March 3, 1879.

Byrd Expedition Headquarters---Little America Completely Airco-Davis-Bournonville Equipped

FOR WELDING AND CUTTING

CUT OFF from the rest of the world for 10 months at a time, confronted with cold running to 75° below zero and gales of 80 to 120 miles which spring up in 15 minutes and may last for days, this self-contained settlement must have the most dependable equipment obtainable, of every sort.

TO meet these conditions, Lieutenant Mulroy, Chief Engineer of the Expedition, and Victor Czegka, Master Mechanic, personally selected cylinders of Airco Oxygen, Airco Acetylene and complete Airco-Davis-Bournonville Welding and Cutting Apparatus for the repair and maintenance of airplanes, tractors, motors and other mechanical equipment.

AIRCO customers in the United States have not only the advantages of this kind of welding and cutting apparatus and gases, but there is available to them Aircooperation—the assistance of Airco Engineers of long experience in solving oxyacetylene problems.

See our exhibits at the National Metal Exposition and American Welding Society, Cleveland, Sept. 9 to 13, Spaces 252 and 331—National Association of Power Engineers, Chattanooga, Sept. 9 to 13, Spaces 48 and 49—International Railway General Foremen's Association, Chicago, Sept. 17 to 20—Traveling Engineers' Association, Chicago, Sept. 24 to 27.

AIR REDUCTION SALES COMPANY

Manufacturers and Distributors of Airco Oxygen, Airco Acetylene, Airco National Carbide, Airco-Davis-Bournonville Welding and Cutting Apparatus and Welding Supplies

Baltimore	Charlotte, N. C.	Detroit	Louisville	Oklahoma City	Richmond
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Boston	Dayton	Los Angeles	New Orleans	Portland, Ore.	Wheeling
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AIRCO DAVIS BOURNONVILLE

Home Office: 342 Madison Avenue, New York City

"RACO" Announces

A new dusted electrode, the last word in an all-purpose electric welding rod

FAST–QUIET–DEPENDABLE Non-Spattering

Samples will be supplied to any interested user upon request. A test in your own plant will be illuminating.

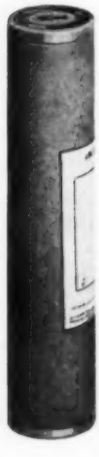
THE "RACO" LINE OF FOURTEEN GRADES includes—

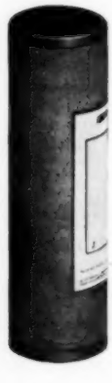
Bare Electrodes, Dusted Electrodes, Flux-Coated Electrodes, Copper-Coated and Plain Finish Oxy-acetylene Welding Rods, Composite Wire for Automatic Arc Welding. Special Wires for Special Purposes.

The New "Raco" Package

Patent applied for

A pressed steel cup fits snugly over each end of a standard fifty-lb. bundle of welding wire. Three tie wires of same analysis as wire in package, are securely welded to edges of each cup holding same in place and giving a package of wonderful strength and lightness, (less than one-half pound). Package is rolled in several plies of heavy paper cemented at ends to each steel cup producing an airtight and waterproof package of extremely neat appearance. The face of each steel cup is painted in a distinctive color in Duco and neatly printed showing grade and size of wire in package.





Some exclusive territories are open for distributors of this very desirable line of welding wires.

We will be interested in hearing from qualified jobbers at once.

A new catalog in color is now ready. Please ask for your copy.

REID-AVERY COMPANY

21st and Washington Ave.

Philadelphia

Pacific Coast Distributors:

M. E. Canfield Company.
316 Commercial Street,
Los Angeles, California

The Welding Engineer

Founded by L. B. Mackenzie, 1916

Volume 14 | September, 1929 | Number 9

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Reputation Attracts Quality

YOU may define reputation any way you wish. One important thing about it is that a large percentage of the people like either to have it or to be associated with it. This truth is of definite help to the manufacturer of well advertised merchandise. Good workmen, who are proud of their ability, like to have it appreciated and like to have a good standard of workmanship set for them. They will naturally put forth their best efforts on products which are, through the medium of advertising, displayed before the public in the most favorable light. The ultimate consumer benefits through the quality which is constantly maintained by this well known trait of human nature. It is the same sort of psychology which attracts the highest type of salesmen to advertised products. They place a high value on their individual ability to serve all customers, and naturally enjoy the additional advantage in a business way which they secure by representing lines whose reputations are strengthened by good publicity. Again it benefits the ultimate consumer, because with lessened sales resistance the salesman is able to devote additional energy to personal service. Good will is the standard by which is measured the real worth of these intangible benefits, which the public is constantly receiving as the result of advertising, though its purpose is frankly to increase sales.

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Last Advertising forms close at 8:00 a. m. on the 12th. To show proof for correction copy must be received at an earlier date and allowances should be made for delay to mails. All copy should be in by the 12th of the month at the latest.

The Welding Engineer does not publish in its news or advertising columns any matter that deals with or refers to either personal or legal controversies.

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SOUTH AFRICA—J. W. Arnison, 35a Victoria Ave., Benoni, Transvaal, South Africa.

Buyers' Index

Readers of The Welding Engineer will find this index to contain the most accurate information obtainable relating to welding apparatus and supplies. The advertising section includes the principal manufacturers of the United States.

ACETYLENE (Compressed in Cylinders)
Air Reduction Sales Co.
Commercial Acetylene Supply Co.
Kansas City Oxygen Gas Co.
Modern Engineering Co.
International Oxygen Co.
Prest-O-Lite Co.

ACETYLENE CYLINDERS
Pressed Steel Tank Co.

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American Steel & Wire Co.
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Koro Corporation
Mueller Brass Co.
Oxweld Acetylene Co.
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Reid-Avery Co.
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Seneca Wire Mfg. Co.
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Stoody Co.
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Williams & Co.

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See "Torches"

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Steel Sales Corp.

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N. A. Strand & Co.

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See "Electric Resistance Welders"

CABLE (Arc Welding)
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Fusion Welding Corp.
Electric Arc Cutting & Welding Co.
General Electric Co.
Gibb Welding Machines Co.
Hollup Corp.
Lincoln Electric Co.
Quasi-Arc, Inc.
John A. Roebling Sons Co.
Joseph T. Ryerson & Sons, Inc.
Westinghouse Elec. & Mfg. Co.
Wilson Welder & Metals Co.

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Shawinigan Products Corp.
Union Carbide Sales Co.

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Central Steel & Wire Co.
Electric Arc Cutting & Welding Co.
National Carbon Co.
Oxweld Acetylene Co.

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Kansas City Oxygen Gas Co.
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Victor Welding Equipment Co.

CAST IRON SOLDER
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Innis, Speiden & Company

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Arcos, Inc.
Electric Arc Cutting & Welding Co.
Fusion Welding Corp.
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Lincoln Electric Co.
National Carbon Co.
Westinghouse Elec. & Mfg. Co.
Wilson Welder & Metals Co.

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Pressed Steel Tank Co.

CYLINDERS (Oxygen, Hydrogen)
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Harrisburg Pipe & Pipe Bending Co.
Wm. Wharton, Jr., Co.

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Stoody Company
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Burke Electric Co.
Electric Arc Cutting & Welding Co.
Electric Welding Machine Co.
Fusion Welding Corporation
General Electric Co.
Goodman Electric Machinery Co.
Gibb Welding Machines Co.
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Quasi-Arc Incorporated
Joseph T. Ryerson & Sons, Inc.
Stoody Co.
Waters Welders, Inc.
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Williams & Co.
Wilson Welder & Metals Co.

ELECTRIC RESISTANCE WELDERS
Federal Machine & Welder Co.
General Electric Co.
Gibb Welding Machines Co.
Goodman Electric Machinery Co.
Joseph T. Ryerson & Son

ELECTRODES (Carbon Arc Welding)
See "Cutting Electrodes"

ELECTRODES (Metallic Arc Welding)
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American Steel Engineering Co.
Arcos, Inc.
Atlas Foundry Co.
Central Steel & Wire Co.
Edgcomb Steel Co.
Electric Arc Cutting & Welding Co.
Fusion Welding Corporation
General Electric Co.
Gibb Welding Machines Co.
Hollup Corp.
Igoe Brothers
Koro Corporation
Lincoln Electric Co.
Maurath, Inc.
National Welding Products Corp.
Page Steel & Wire Co.
Quasi-Arc, Incorporated
Reid-Avery Co.
Roebling, John A., Sons Co.
Joseph T. Ryerson & Sons, Inc.
Seneca Wire & Mfg. Co.
Steel Sales Corp.
Stoody Company
Taylor-Wharton Iron & Steel Co.
Wickwire Spencer Steel Corp.
Williams & Co.
Wilson Welder & Metals Co.

ELECTRODE HOLDERS
Allan Mfg. & Welding Co.
Burke Electric Co.
Electric Welding Machine Co.
Fibre-Metal Products Co.
Fusion Welding Corporation
General Electric Co.
Gibb Welding Machines Co.
Hollup Corp.
Koro Corporation
Lincoln Electric Co.
Northwestern Mfg. Co.
Owen Electric Mfg. Co.
Stoody Co.
Waters Welders, Inc.
Westinghouse Elec. & Mfg. Co.
Williams & Co.
Wilson Welder & Metals Co.

ELECTRODE TIPS (Resistance Welding)
Elkon, Inc.

ELECTROLYTIC OXYGEN AND HYDROGEN GENERATING EQUIPMENT
International Oxygen Co.

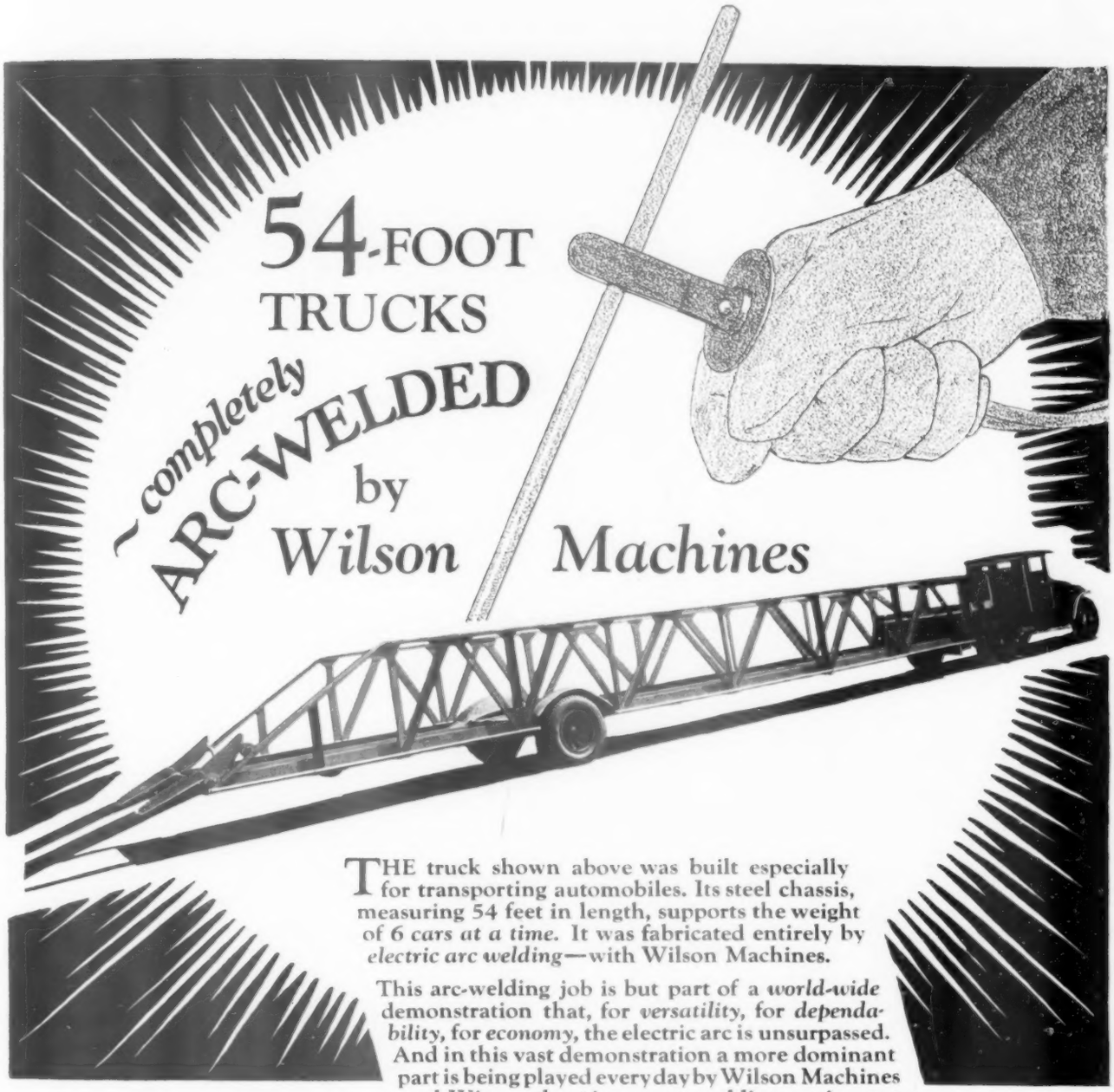
FACE SHIELDS (Arc Welding)
Allan Mfg. & Welding Co.
Burke Electric Co.
Central Steel & Wire Co.
Chicago Eye Shield Co.
Electric Arc Cutting & Welding Co.
Fibre-Metal Products Co.
Fusion Welding Corporation
General Electric Co.
Gibb Welding Machines Co.
Hollup Corporation
Ideal Face Shield Co.
Lincoln Electric Co.
Northwestern Mfg. Co.
Owen Electric Mfg. Co.
Quasi-Arc, Incorporated
Stoody Company
Joseph T. Ryerson & Sons, Inc.
Sellstrom Mfg. Co.
Westinghouse Elec. & Mfg. Co.
Waters Welders, Inc.
Williams & Co.
Wilson Welder & Metals Co.
Willson Products, Inc.

FIREPROOF PLASTIC MATERIAL
Air Reduction Sales Co.
National Carbon Co.

FLUE WELDERS (Electric)
General Electric Co.
Joseph T. Ryerson & Sons, Inc.

FLUXES
Air Reduction Sales Co.
Anti-Borax Compound Co.
Kansas City Oxygen Gas Co.
Metal & Thermit Corp.
Central Steel & Wire Co.
Modern Engineering Co.
Oxweld Acetylene Co.

54-FOOT TRUCKS completely ARC-WELDED by Wilson Machines

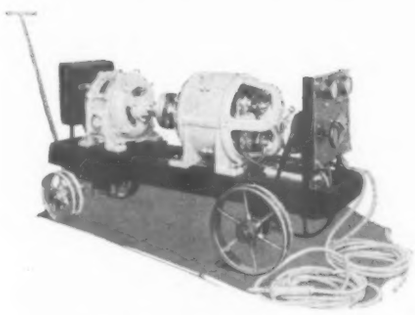


THE truck shown above was built especially for transporting automobiles. Its steel chassis, measuring 54 feet in length, supports the weight of 6 *cars at a time.* It was fabricated entirely by *electric arc welding*—with Wilson Machines.

This arc-welding job is but part of a *world-wide* demonstration that, for *versatility*, for *dependability*, for *economy*, the electric arc is unsurpassed. And in this vast demonstration a more dominant part is being played every day by Wilson Machines and Wire — the *pioneer* arc-welding equipment.

No matter what your industry—no matter what your metal-joining problem—you can minimize risks and save money by welding with the electric arc. And you can assure yourself the *maximum* advantages of electric arc welding by using Wilson Machines and Wire—known in practically every industry and in 44 nations for their strong, permanent and homogeneous welds.

You are invited to consult Wilson Engineers.



The Wilson Model S Welding Machine shown above is the Type 200 Amperes, one-operator, electric-motor-driven outfit.

WILSON WELDER & METALS CO. INC., 20 WILSON BUILDING, HOBOKEN, N. J.

WILSON

WELDING MACHINES AND WELDING WIRE

St. Paul Welding & Mfg. Co.
Torchweld Equipment Co.
Weldit Acetylene Co.

GAS SAVING DEVICES
Harris Calorific Co.
Weldit Acetylene Co.

GLOVES (Asbestos)
Ideal Face Shield Co.
Olympic Glove Co.

GAUGES
MotoMeter Gauge & Equipment Corp.

GENERATORS (Acetylene)
Air Reduction Sales Co.
Bastian-Blessing Co.
Craftsweld Equipment Co.
Imperial Brass Mfg. Co.
Harris Calorific Co.
Milburn, Alexander, Co.
Modern Engineering Co.
Oxweld Acetylene Co.
Sight Feed Generator Co.

GOGGLES
Chicago Eye Shield Co.
Ideal Face Shield Co.
Sellstrom Mfg. Co.
Willson Products, Inc.

GRINDERS (Portable Electric)
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Stoody Company
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HELMETS (Arc Welding)
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Burke Electric Co.
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General Electric Co.
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Ideal Face Shield Co.
Lincoln Electric Co.
Northwestern Mfg. Co.
Owen Electric Mfg. Co.
Quasi-Arc, Incorporated
Sellstrom Mfg. Co.
Waters Welders, Inc.
Westinghouse Elec. & Mfg. Co.
Williams & Co.
Wilson Welder & Metals Co.
Willson Products, Inc.

HYDROGEN
Gas Products Association
International Oxygen Co.

HYDROGEN GENERATING PLANTS
International Oxygen Co.

LEAD WELDING UNITS
Air Reduction Sales Co.
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Craftsweld Equipment Co.
Sellstrom Mfg. Co.
Imperial Brass Mfg. Co.
International Oxygen Co.
Kansas City Oxygen Gas Co.
K-G Welding & Cutting Co.
Modern Engineering Co.
Milburn, Alexander, Co.
Oxweld Acetylene Co.
Torchweld Equipment Co.
Victor Welding Equipment Co.
Weldit Acetylene Co.

LIGHTERS (For Gas Torches)
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Harris Calorific Co.
Imperial Brass Mfg. Co.
International Oxygen Co.
K-G Welding & Cutting Co.
Kansas City Oxygen Gas Co.
Matchless Utilities Co.
Milburn, Alexander, Co.
Modern Engineering Co.
Oxweld Acetylene Co.
Safety Gas Lighter Co.
Shoot-a-Lite Corporation
Torchweld Equipment Co.

MANIFOLDS
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Bastian-Blessing Co.
Craftsweld Equipment Co.
General Welding and Equipment Co.
Harris Calorific Co.
Imperial Brass Mfg. Co.
International Oxygen Co.
Kansas City Oxygen Gas Co.
K-G Welding & Cutting Co.
Milburn, Alexander, Co.
Modern Engineering Co.
Oxweld Acetylene Co.
Torchweld Equipment Co.
Victor Welding Equipment Co.

MECHANICALLY OPERATED CUTTING AND WELDING TORCHES
Air Reduction Sales Co.
General Welding and Equipment Co.
Oxweld Acetylene Co.
Torchweld Equipment Co.

MOLDING MATERIAL
See "Fireproof Plastic Material"

MONEL METAL RODS AND ELECTRODE
Central Steel & Wire Co.
Wilson Welder & Metals Co.

NEEDLE VALVES
Air Reduction Sales Co.
Bastian-Blessing Co.
Harris-Calorific Co.
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International Oxygen Co.
Kansas City Oxygen Gas Co.
K-G Welding & Cutting Co.
Milburn, Alexander, Co.
Modern Engineering Co.
Oxweld Acetylene Co.
Torchweld Equipment Co.
Victor Welding Equipment Co.

NITROGEN
Air Reduction Sales Co.
Gas Products Association
Linde Air Products Co.
International Oxygen Co.

OXYGEN
Air Reduction Sales Co.
Gas Products Association
International Oxygen Co.
Kansas City Oxygen Gas Co.
Modern Engineering Co.
Linde Air Products Co.

PIPE (Iron)
American Rolling Mill Co.

PIPE BENDS AND COILS
Harrisburg Pipe and Pipe Bending Co.

PLATES (Iron)
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Jos. T. Ryerson & Sons, Inc.

PORTABLE ARC WELDING OUTFITS (Mounted on Trucks)
General Electric Company
Electric Arc Cutting & Welding Co.
Fusion Welding Corporation
Lincoln Electric Co.
Northwestern Mfg.Co.
Joseph T. Ryerson & Sons, Inc.
Shrader Electric Company
Wilson Welder & Metals Co.
Westinghouse Elec. & Mfg. Co.

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Metal & Thermit Corp.
St. Paul Welding & Mfg. Co.

REAMERS (Portable Electric)
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N. A. Strand & Co.

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Craftsweld Equipment Co.
Fusion Welding Corporation
General Welding and Equipment Co.
Harris Calorific Co.
Imperial Brass Mfg. Co.
International Oxygen Co.
Kansas City Oxygen Gas Co.
K-G Welding & Cutting Co.
Milburn, Alexander, Co.
Modern Engineering Co.
Oxweld Acetylene Co.
St. Paul Welding & Mfg. Co.
Joseph T. Ryerson & Sons, Inc.
Sight Feed Generator Co.
Stoody Company
Torchweld Equipment Co.
Victor Oxy-Acetylene Equipment Co.
Weldit Acetylene Co.
Williams & Co.

SCORED CYLINDER REPAIR MATERIALS
Kansas City Oxygen Gas Co.

SEAM WELDERS
See "Electric Resistance Welders"

SHEETS (Iron)
American Rolling Mill Co.
Jos. T. Ryerson & Sons, Inc.

SILVER SOLDER
Handy & Harman

SPOT WELDERS
See "Electric Resistance Welders"

TANK CONNECTIONS
Air Reduction Sales Co.
Bastian-Blessing Co.
Harris Calorific Co.
Imperial Brass Mfg. Co.
International Oxygen Co.
Kansas City Oxygen Gas Co.
K-G Welding & Cutting Co.
Milburn, Alexander, Co.
Oxweld Acetylene Co.
Torchweld Equipment Co.

THERMIT WELDING
Metal & Thermit Corp.

TORCHES (Welding and Cutting)
Air Reduction Sales Co.
Craftsweld Equipment Co.
Bastian-Blessing Co.
General Welding and Equipment Co.
Fusion Welding Corporation
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CHASE

the mark of good welding rod

In Chase Welding Rod—Chāmet* Bronze, Manganese Bronze and Brass—you will find all the qualities you demand of top-notch welding rod. Toughness and elasticity . . . low melting point . . . easy flowing . . .

Look for the name "Chase" indelibly die-stamped on every length of genuine Chase Welding Rod—it is your guarantee of tough, lasting welds.

*Chase Chāmet Bronze is a special bronze alloy developed in the Chase Laboratories. We have named it Chāmet to distinguish it from ordinary kinds of bronze. Full details of tensile strength, elasticity and machining properties gladly furnished on request.

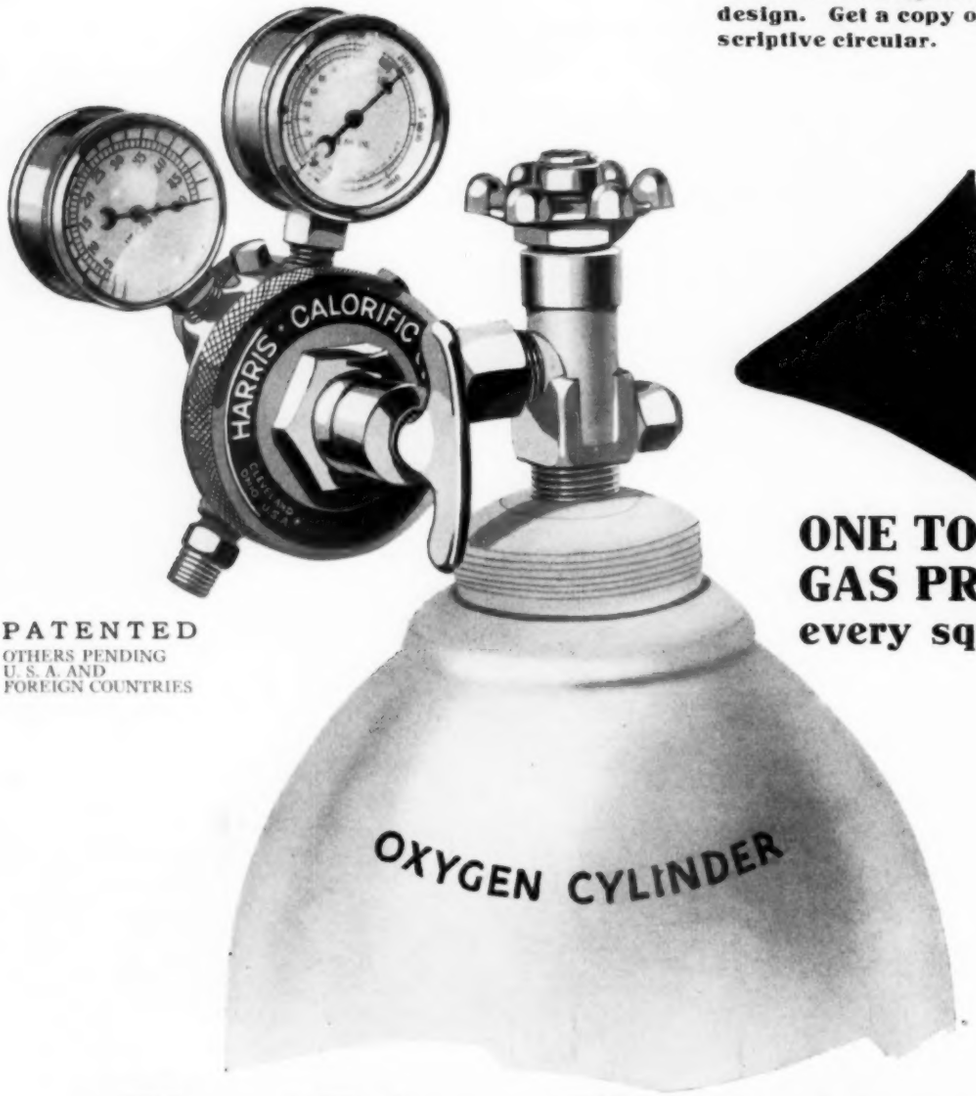
CHASE WELDING ROD

Chase Manganese Bronze Welding Rod
Chase Chāmet Bronze Welding Rod
Chase Brass Welding Rod

CHASE BRASS & COPPER CO.
—INCORPORATED—
Home Office: Waterbury, Conn.

And prompt deliveries always from the nearest of our fourteen Warehouses in New York · Boston · Newark · Philadelphia · Baltimore · Cincinnati · Cleveland · Detroit · Chicago · Minneapolis · St. Louis · New Orleans · Los Angeles · San Francisco. (Also Branch Offices in Rochester, Pittsburgh and Dallas.)

Every experienced oxy-acetylene welder will marvel at the performance of the new MULTI-STAGE under the tests described below. Its ability to stand such tests without injury is due to an entirely new principle of regulator design. Get a copy of the new illustrated descriptive circular.



ONE TON GAS PRESSURE every square inch

PATENTED
OTHERS PENDING
U. S. A. AND
FOREIGN COUNTRIES

The "Fifteen Years' Abuse" Test

It is recognized that one of the worst abuses which can be inflicted on the delicate mechanism of the ordinary gas pressure regulator is to release the cylinder valve of a tank containing oxygen at 2000 lbs. pressure when the pressure adjusting screw of the regulator is turned in to the working pressure. The sudden entrance of the gas under these conditions snaps the seat of the regulator against the nozzle so forcibly as to make a deep impression, thereby upsetting the function of the regulator. This is not done intentionally but persons not acquainted with the correct handling and use of regulators often handle them thoughtlessly in this way. At quitting time, for example, many operators simply turn off the cylinder valve and forget to release the adjusting screw. Then in the morning when work is resumed they turn on the gas at the cylinder without thinking of the bad effect on the regulator seat.

The MULTI-STAGE regulator is designed to stand a lot of this kind of abuse, but to get some definite data it was subjected to a test to see how far it could go before the seats required replacing. For this test the regulator screw was turned in to 50 lbs., which is the maximum pressure for welding, the cylinder valve closed, the gas drained out of the regulator without disturbing the adjusting screw, then suddenly the full tank pressure was turned on, in this case 2200 lbs. per sq. in. This was repeated over 4000 times without disturbing the function of the regulator. In other words, figuring that there are about 250 days in the year in which such action might take place once a day, that would make this test equivalent to fifteen years of such service. If this action was supposed to take place three times a day, morning, noon and night, it would be the equivalent of such abuse covering a period of five years. This is just one of the tests which have been conducted to prove that what has been considered abuse is just ordinary service for the MULTI-STAGE regulator.

The "Brass Filings" Test

Another precaution which is common in the use of oxy-acetylene equipment is that of blowing out cylinder valves before adjusting the regulators, to guard against introducing dust or dirt or metal particles onto the regulator. But the MULTI-STAGE regulator was proof against injury from dust particles. To demonstrate this point, brass filings were placed in the inlet connection of a MULTI-STAGE regulator and the gas turned on. In this way was demonstrated the positive protection against injury of particles of foreign matter which is provided by the special screen devices used in the MULTI-STAGE.

Specify the NEW

MULTI
COPYRIGHTED
STAGE

GAS PRESSURE REGULATORS

Because

1. Two stages of Pressure Control positively INSURE correct flames.
2. Multi-Stage reduction permits the use of proper seats of different characters, each best for its function. It is not a case of one seat for the dual purpose of HOLDING 2,000 pounds pressure and CONTROLLING it also.
3. Double diaphragmic action (by two diaphragms, each of the proper diameter and material) correctly proportions the control and release burden.
4. Two springs in support of the diaphragms divide the spring tension load in its course from cylinder to torch tip effecting constancy and accuracy of gas flow.
5. The design drops from use the arm supported nozzle and seat which required perfection in alignment under difficult conditions of design.
6. With adjusting screw set at WORKING PRESSURE, the full cylinder pressure may be turned on without injury to the regulator in any way.
7. Sand and dust accumulated in cylinder valves can be blown into regulator without disturbing its functioning—a protective cartridge stands guard.

Manufactured by

HARRIS CALORIFIC CO.

Cleveland, Ohio

Any of the distributors listed below will cheerfully furnish full information

National Oxygen Co.	Akron, Ohio
Albany Calcium Light Co	Albany, N. Y.
R. S. Armstrong & Bro. Co	Atlanta, Ga.
Moore-Handley Hdwe. Co	Birmingham, Ala.
Eastern Service Company	Boston, Mass.
International Oxygen Co	Buffalo, N. Y.
W. J. Krull	Canton, Ohio
National Oxygen Co	Chicago, Ill.
Buckeye Welding Supply Co	Cleveland, Ohio
Welding Metals Mfg. Co	Detroit, Mich.
Smithweld Equipment Co	Ft. Worth, Texas
Smithweld Company	Houston, Texas
Swank Hardware Co	Johnstown, Pa.
Mo-Ark Oxygen Company	Ft. Smith, Ark.
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Balbach Company	Omaha, Nebr.
Harris Sales Co	Philadelphia, Pa.
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Hope Construction & Refining Co	Pittsburgh, Pa.
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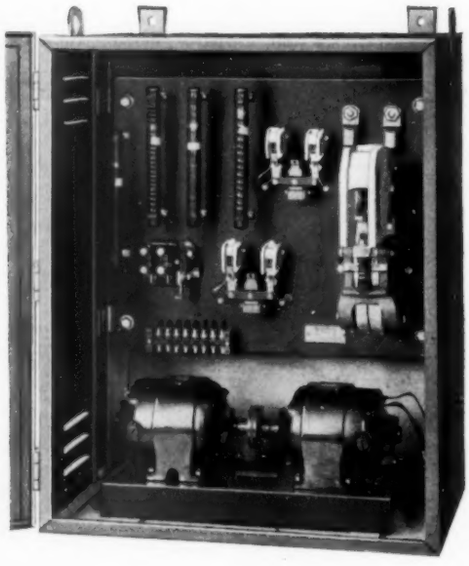
Welding & Metal Trades Supply Ltd.,	Vancouver, B. C.
H. B. Holden Company	Windsor, Ontario
Seattle Hardware Co	Alaska
Seattle Hardware Co	Honolulu, T. H.
Tropical Sales Agency	Havana, Cuba

Announcing

The compact Weldomatic Head.



The Weldomatic control and motor generator set govern the operation of the head so as to give an electrode feed exactly equal to the electrode consumption.

The operator's panel affords complete control of the Weldomatic.

Westinghouse

T 30738

the Weldomatic

a full automatic arc-welding machine

—designed to meet the demand for an automatic welder of very compact mounting dimensions—a welding device that is as reliable and easily operated as the usual shop tool.

A compact design is the result of a new method of arc voltage control, whereby electrical control replaces the usual combination of clutches, relays, springs, etc. This gives positive drive without slippage, and eliminates delicate adjustments and expensive upkeep.

Dependable performance results from this design. It assures a uniform wire feed at the exact rate of electrode consumption necessary to hold a constant arc voltage; therefore, the best welding arc.

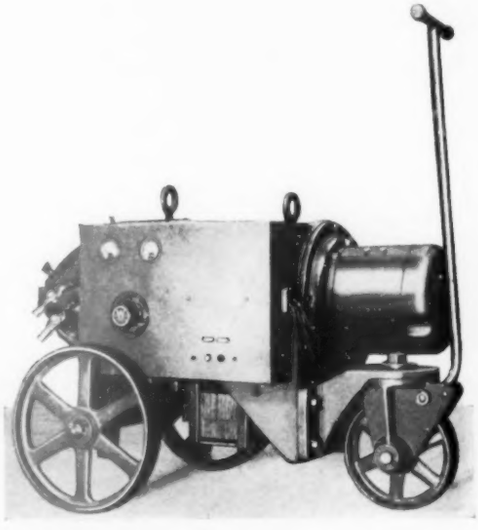
"More than nine hundred working hours without the loss of any time", constitutes the experience of one proving ground, a large pipe manufacturing concern.

Easy operation—The operator presses the starting button and the control automatically strikes and holds the arc. The operator may adjust the welding current over a wide range by a single dial rheostat.

See the Weldomatic in operation at the National Metal Exposition, Cleveland, Ohio, September 9-13 and at the International Petroleum Exposition, Tulsa, Oklahoma, October 5-12. Detailed information can be obtained from the nearest Westinghouse Office.

WESTINGHOUSE ELECTRIC & MFG. COMPANY
EAST PITTSBURGH PENNSYLVANIA
SALES OFFICES AND SERVICE SHOPS IN ALL PRINCIPAL CITIES

Numerous well-equipped and efficiently-manned Service Shops throughout the country assure prompt SERVICE to the purchasers of Westinghouse products.

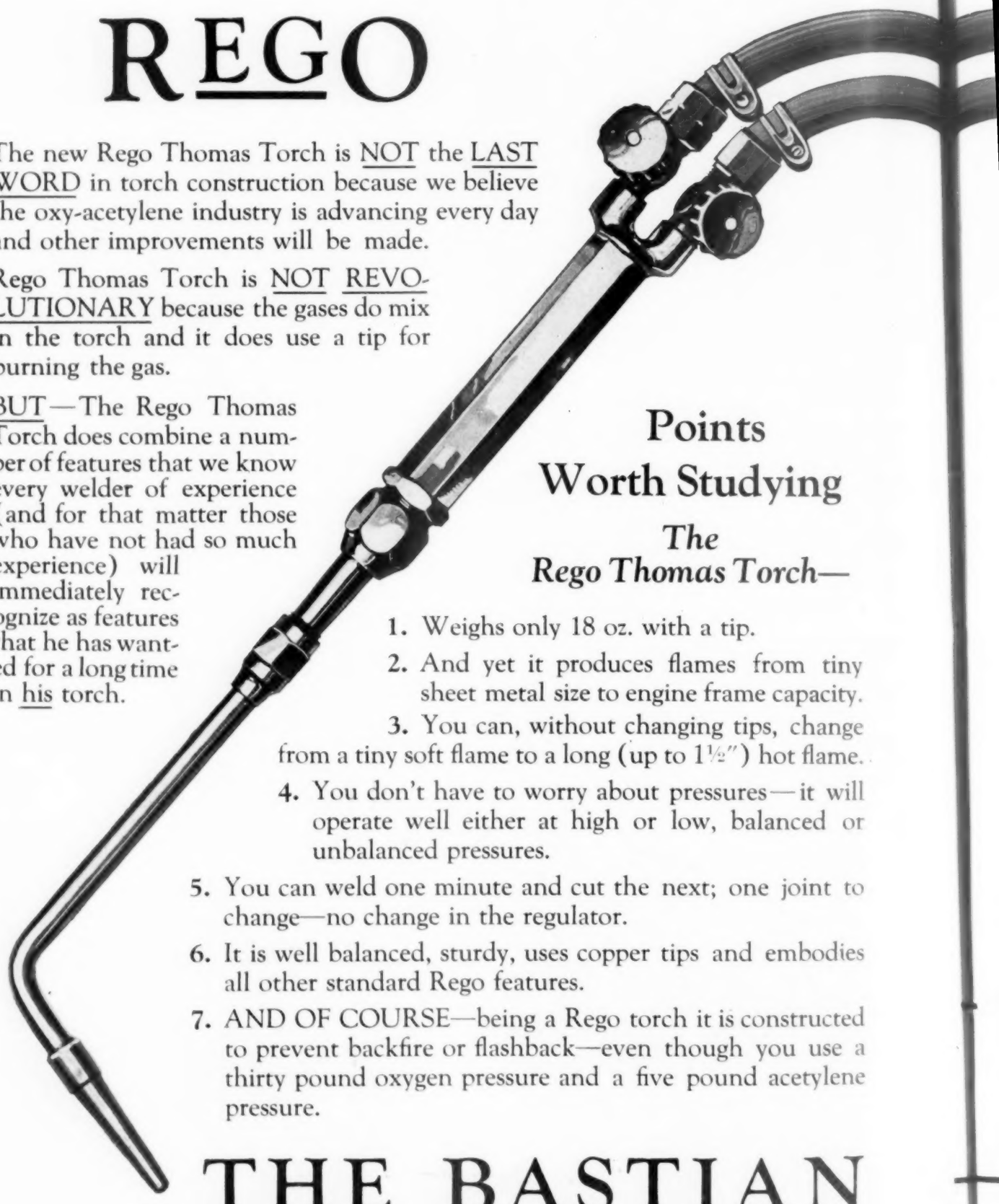


The line of Westinghouse welders is complete and includes ten distinct single-operator sets. This shows the 200-ampere, a-c. motor-driven welder.

Arc Welders

T 30738-A

REGO



The new Rego Thomas Torch is NOT the LAST WORD in torch construction because we believe the oxy-acetylene industry is advancing every day and other improvements will be made.

Rego Thomas Torch is NOT REVOLUTIONARY because the gases do mix in the torch and it does use a tip for burning the gas.

BUT—The Rego Thomas Torch does combine a number of features that we know every welder of experience (and for that matter those who have not had so much experience) will immediately recognize as features that he has wanted for a long time in his torch.

Points Worth Studying

The Rego Thomas Torch—

1. Weighs only 18 oz. with a tip.
2. And yet it produces flames from tiny sheet metal size to engine frame capacity.
3. You can, without changing tips, change from a tiny soft flame to a long (up to 1½") hot flame.
4. You don't have to worry about pressures—it will operate well either at high or low, balanced or unbalanced pressures.
5. You can weld one minute and cut the next; one joint to change—no change in the regulator.
6. It is well balanced, sturdy, uses copper tips and embodies all other standard Rego features.
7. AND OF COURSE—being a Rego torch it is constructed to prevent backfire or flashback—even though you use a thirty pound oxygen pressure and a five pound acetylene pressure.

THE BASTIAN

250 East Ontario Street

ThomaS

Roy Thomas, the inventor of the Rego Thomas Torch, is NOT a WIZARD ENGINEER—but he does know welding—he has operated torches of all kinds for many years, and he is in the field every day conferring with the fellow who uses torches, and knowing the "show me" attitude of the welder, he says—"Just try a Rego Thomas. It sells itself."

Prices Worth Considering

Rego Thomas Torch—

With tip, hose connections and wrench $18.00

Extra tips, drill size of outlet numbers 30, 32, 36, 41, 44, 48, 51, 54, 62 and 72, Each $4.00

Three inch extension. Each $4.00

Six inch extension. Each $4.50

R T Cutting Attachment with one tip. Each $20.00

Complete "Hot Spot" Outfit, including Rego Thomas Torch, 3 tips, large two gauge regulators, hose and wrench . . $67.50

Complete "Pipeweld" Outfit, including Rego Thomas Torch, 3 tips, light two gauge regulators, hose and wrench . . $64.00

BLESSING CO.

CHICAGO, ILLINOIS

An indelible record

JOIN US IN THE GENERAL ELECTRIC HOUR, BROADCAST EVERY SATURDAY AT 8 P.M., E.S.T. ON A NATION-WIDE N.B.C. NETWORK

GENERAL

GENERAL ELECTRIC COMPANY,

welded in steel

G-E Type "F" electrode is comparatively new. But within two years, it has attained a commanding position among electrodes. Its brief record is indelibly welded in the steel of railroads and industry.

No single quality can explain a welding operator's preference for Type "F". He may tell you that it handles easily in any position or may point out the neat welds; and you, yourself, may note its remarkable arc stability and rapid deposition. Among its many desirable characteristics, these are enough to explain the favorable reputation of Type "F".

For months, General Electric has been pointing out various applications for Type "F". Results are daily justifying its exclusive use for certain types of welding. If yours is a business *where steel is being joined to steel,* you owe it to your best interests to try this electrode in your shop.

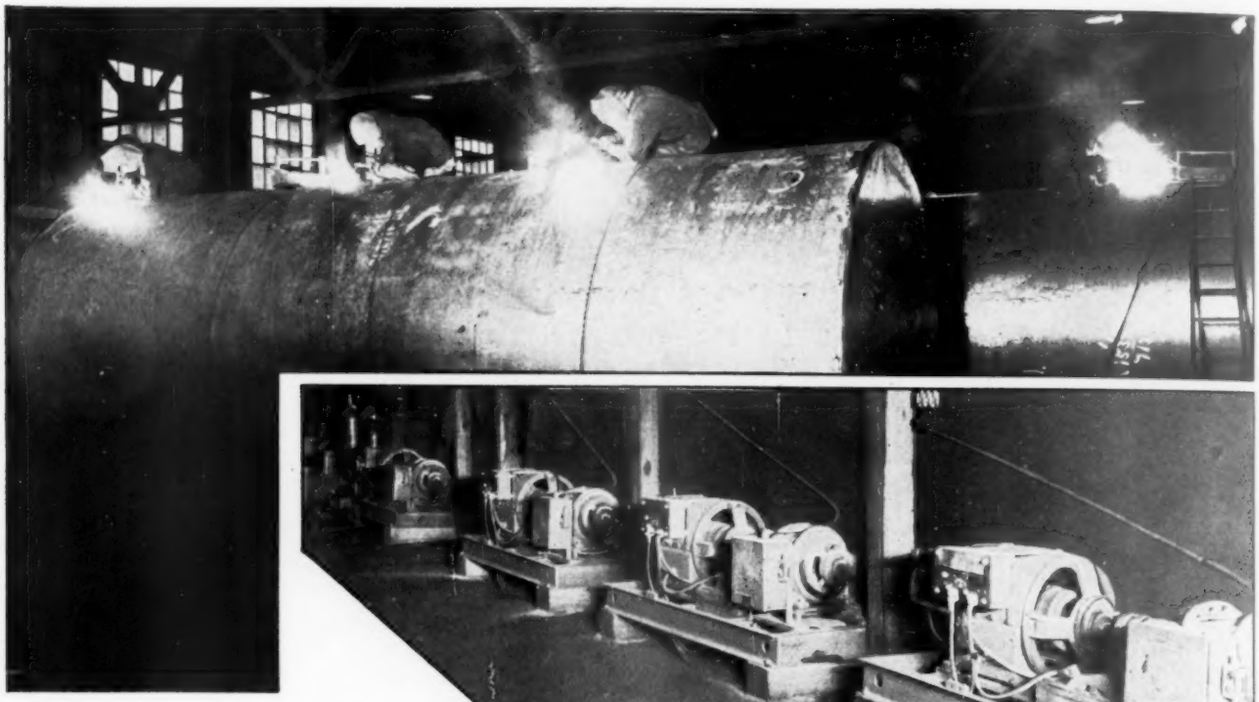
General Electric manufactures other outstanding electrodes for different kinds of welding. For prompt service or additional information on Type "F" or other G-E electrodes, get in touch with the G-E Welding Electrode Distributor near you or write to Section E-536, Merchandise Department, General Electric Company, Bridgeport, Connecticut.

For simplicity, reliability, and ease of operation, G-E arc-welding sets are unequalled. They are available in all sizes, all types—for either hand or automatic operation—for one or more operators.

550-513

ELECTRIC

BRIDGEPORT, CONNECTICUT



Building a Great Business on Arc Welding

THE MORE YOU ARC WELD

THE MORE YOU SAVE THE BETTER YOUR PRODUCT

In any new field, the pioneer with vision and courage always becomes a dominant factor once the experimental stage is passed. Such a pioneer was the Adamson Manufacturing Company, East Palestine, Ohio, when, in 1920, it began using G-E welding equipment to arc-weld its tanks.

To-day, after nine years, this company is one of the largest and most successful tank builders in the country—with a battery of 32 G-E arc-welding sets and a daily output of over 300 completed gasoline and fuel-oil storage tanks.

In practically every industry there are countless opportunities for pioneering in the application of arc welding. Are you taking full advantage of these opportunities? If not, call up the welding specialist in the nearest G-E office. He is there to help you, without obligation.

530-63

JOIN US IN THE GENERAL ELECTRIC HOUR, BROADCAST EVERY SATURDAY AT 8 P. M., E. S. T. ON A NATION-WIDE N. B. C. NETWORK

GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., SALES OFFICES IN PRINCIPAL CITIES

STOODY COMPANY

NATIONAL METAL CONGRESS

Welcome!!

to the Stoody Booth at the National Metals Exposition.

The *world* has used our products, and *now* we invite the world to meet the boys that make, sell and tell about them

STOODITE . . . STOODY ROD . . . BORIUM . . . Welding Rods for every use . . . STOODY GRINDERS . . . each of this famous family of quality will be on display, *and*, a welcoming "reg'lar guy" will be on hand to tell about them. C'mon gang !! our booth is 241. Welcome !!

If you can't attend, don't be downhearted. A card or letter to us will bring full information

STOODY COMPANY

Manufacturers of WELDING ROD • ALLOY STEELS • EQUIPMENT

WHITTIER, CALIFORNIA

Kaustine Company Inc.

MANUFACTURERS AND SANITATION ENGINEERS

EXECUTIVE OFFICES. BUFFALO, N. Y.

June 28th, 1926.

American Rolling Mill Company,
Oliver Building,
Pittsburgh, Pennsylvania.

Attention of Mr. Harry A. Lord.

Gentlemen:-

With regard to the welding qualities of Armco Ingot Iron as compared with steel, we have been using Armco Ingot Iron for over ten years and have welded it by both the elctric and oxy-acetylene methods and have always found that the Armco Ingot Iron welds faster than steel. The metal seems to flow more freely, enabling the men to work faster and still get a tight weld.

We use Armco Ingot Iron in various gauges from No.14 to 3/16" and our Superintendent believes that the Armco Ingot Iron averages about 10% faster than steel.

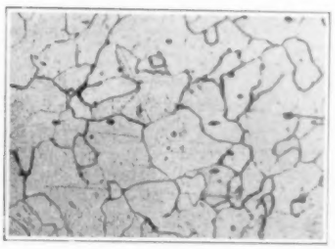
Yours very truly,

KAUSTINE COMPANY INC.

ADS O Purchasing Agent.

"ARMCO Ingot Iron *averages 10% faster"*

This typical photomicrograph of ARMCO Ingot Iron shows the reason for its exceptional weldability. Observe the dense, even texture, the virtual absence of segregated impurities, the predominance of "ferrite" or pure iron grains. These help materially in making clean, dense welds.



THE experience of "Kaustine" with ARMCO Ingot Iron is echoed by many other companies and shops that use this pure iron for welding purposes.

ARMCO Ingot Iron

Whether the Acetylene or Electric Arc welding process is employed, ARMCO Ingot Iron invariably welds smoother and sounder than ordinary metals.

Purity, consistent uniformity, and freedom from occluded gases—these important characteristics of pure ARMCO Ingot Iron play a vital part in better and more profitable welding.

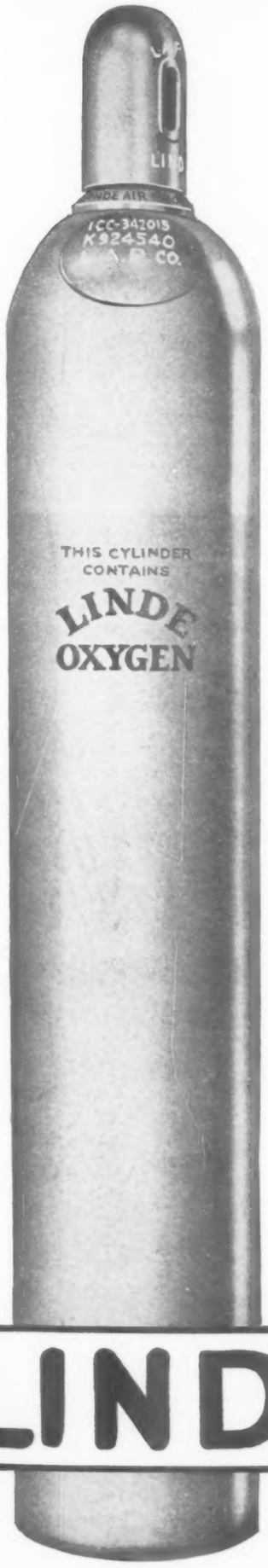
We shall be glad to give you complete information on the weldability, rust-resistance, and sales advantages of ARMCO Ingot Iron. Just communicate with any of the offices listed below.

THE AMERICAN ROLLING MILL CO.
Executive Offices, Middletown, Ohio
Export: The ARMCO International Corporation
Cable Address—ARMCO, Middletown (O)

District Offices:

Chicago, Cincinnati, Cleveland, Detroit, New York, Philadelphia, Pittsburgh, St. Louis, San Francisco

ARMCO INGOT IRON RESISTS RUST



LINDE Scores Again

TO meet the imperative demand for utmost efficiency in oil and natural gas distribution, a seamless tube manufacturer recently developed a super high-test pipe. Obviously, to obtain any benefit of this new development, the joint had to be at least as strong and preferably stronger than the pipe. Available joints were not good enough.

The problem was put up to Linde. And through the efforts of the Linde Research Laboratories and Development Division, an oxwelded joint was developed that in repeated tests outpulled the pipe with never a failure in the weld. Linde had scored again.

Linde Process Service is available without cost to users of Linde Oxygen.

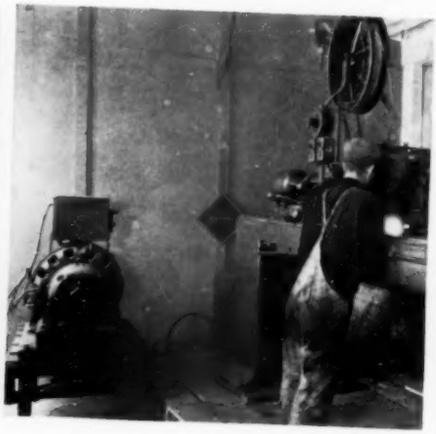
THE LINDE AIR PRODUCTS CO.

Unit of Union Carbide and Carbon Corporation

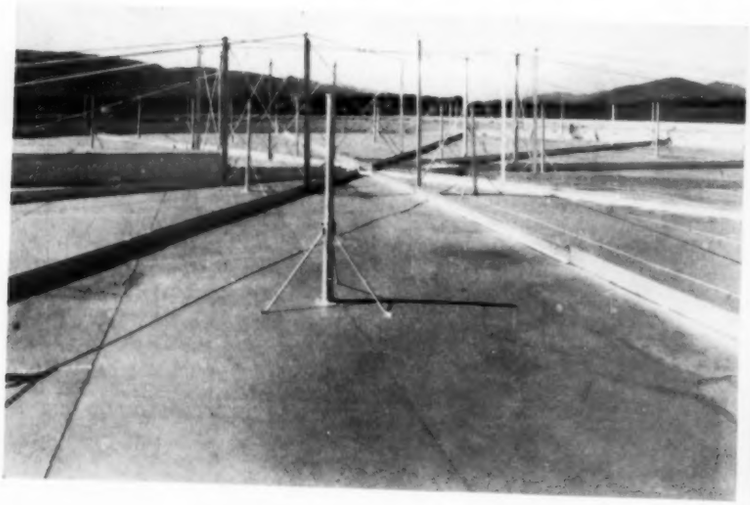
UCC

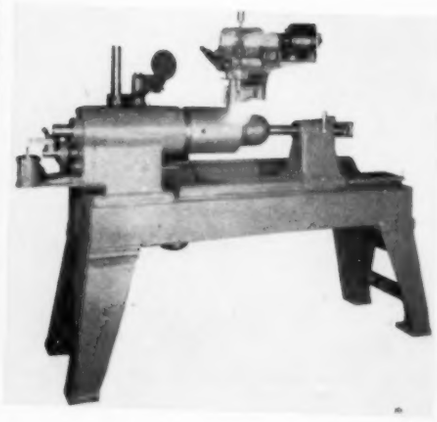
General Offices: Carbide and Carbon Building
30 East 42nd Street, New York

LINDE OXYGEN



"KORO" on the job





"KORO" Grade No. 1

This is our latest development in automatic arc welding wire. It has the distinctive KORO knurling which enables us to incorporate the correct amount of flux in the rod and still have a perfect electrical contact all around the wire. In comparison with other wires for automatic arc welding it has shown greater speed, greater penetration and better deposit, with a result that production is both improved and increased. It can also be used for high speed hand welding. When used in this way the electrode can be melted down until the holder touches the parent metal, resulting in less waste and less frequent changing of electrodes. This wire can be furnished in reels for automatic arc welding or in straight lengths for high speed hand welding. Stock sizes are 3/32", 1/8", 5/32", 3/16" and 1/4". Other sizes can be furnished on order.

"KORO" Flux Coated Grade No. 3 Electrodes

This is a 13-18 carbon wire conforming to American Welding Society specification E-1 B. The outstanding performance feature of this wire is a stable arc and the strong homogeneous weld which results from its use. This rod was especially developed for use on transformer types of arc welding machines. However, it is also recommended for use on D C motor generator welding machines in cases where more than the usual arc stability is required. The coating is applied so as to leave one end bare, for the purpose of giving a perfect electrical contact. This results in uniform working of the metal. Customers report that a tensile strength of 55000 pounds per square inch is consistently obtained with it. This wire is furnished in straight lengths packed in 50 lb. and 100 lb. boxes. Stock sizes are 3/32", 1/8", 5/32", 3/16" and 1/4". Other sizes can be furnished on order.

"KORO" Processed Electrodes

This is a popular electrode for general metallic arc welding. It is a low carbon steel electrode capable of carrying a higher current. Its exceptional arc stability makes it popular among welders because of the ease of manipulation. It gives good results in overhead and vertical welds as well as in the down position. It is especially recommended for the fabrication of steel tanks, structural shapes, etc., where a maximum output, combined with a good quality of weld, is desired. Tank builders have found that the added stability furnished by this electrode has enabled them to increase the operators' output upwards of 25% as compared to the production obtained using bare wire. These electrodes are furnished in straight lengths. Stock sizes are 3/32", 1/8", 5/32", 3/16" and 1/4". Other sizes can be furnished on order.

These wires improve production—yet they cost no more

EXCEPTIONAL manufacturing facilities and exclusive KORO manufacturing processes enable us to supply at competitive prices a complete line of welding wires for the entire range of production welding operations. They are record-breakers for speed and good results. No shut-downs on account of excessive spatter. No rejects on account of porous spots. KORO uniformity prevents all that. Many nationally known products are now welded with KORO, with greater satisfaction than ever before. Take a tip from some of America's pioneer production welders —investigate KORO today.

KORO CORPORATION
WAUKEGAN, ILLINOIS

"KORO" Coated Grade "B" Electrodes

This electrode is our standard flux coated steel electrode. It is 13-18 carbon wire conforming to American Welding Society specification E-1 B. The electrode has the distinctive KORO knurling feature. This results in uniform distribution of the flux over the surface of the electrode and also a concentration of the heat at regular intervals, which speeds up the rate of depositing. This electrode has given splendid satisfaction wherever a smooth flowing deposit and sound weld is required. Therefore it is recommended for all around work on rolled steel and cast steel. It can be used with assurance on work requiring high tensile strength in the weld. Grade B electrodes are furnished in straight lengths. Stock sizes are 3/32", 1/8", 5/32", 3/16", and 1/4". Other sizes can be furnished on order.

"KORO" Grade D

This is a special coated electrode which has been developed to meet the demand for material to use in welding cast iron. It has produced splendid results where machineable welds in cast iron are necessary. The stock sizes are 1/4", 3/16", 5/32" and 1/8". Other sizes can be furnished on order.

"KORO" Grade E-A

(*Bare Electrodes*)

This is a commercially pure iron electrode conforming to American Welding Society specification E-1 A. It is recommended for steel welding where the requirement is for greatest possible degree of ductility. It can be furnished in annealed or hard drawn finish. Stock sizes are 1/32", 1/16", 5/64", 3/32" and 1/4". Other sizes can be furnished on order.

"KORO" Grade E-B

(*Bare Electrodes*)

This is a medium carbon bare electrode conforming to American Welding Society specification E-1 B. The phosphorous and sulphur content are both very low. The wire is recommended for arc welding heavy plate or structural steel where high tensile strength is required. Stock sizes are 3/32", 1/16", 5/32", 3/16" and 1/4". Other sizes can be furnished on order.

"KORO" Grade G-A

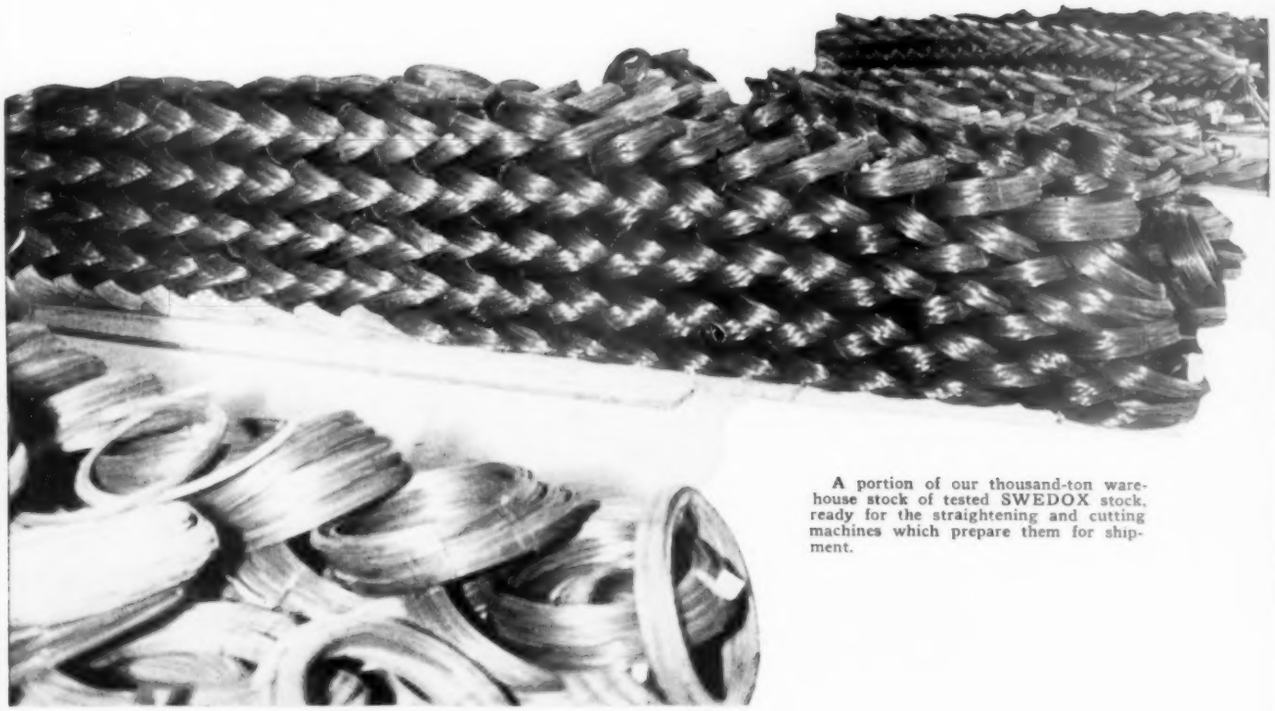
This is a copper coated commercially pure iron rod annealed, conforming to American Welding Society specification G-1 A for oxy-acetylene welding rod. It is particularly recommended for all welding on mild steel where the requirement is for a high degree of ductility in the weld. Stock sizes are 1/4", 3/16", 1/8", 3/32" and 1/16". Other sizes can be furnished on order.

"KORO" Grade C

This is a copper coated steel rod for oxy-acetylene welding, conforming to American Welding Society Folio 1-G. This is an unusually fine flowing welding rod and is recommended especially for gas welding on all forms of mild steel where the requirement is for high tensile strength in the weld. Stock sizes are 1/4", 3/16", 1/8", 3/32" and 1/16".

"KORO CUTS COST"

Every coil has a reputation



A portion of our thousand-ton warehouse stock of tested SWEDOX stock, ready for the straightening and cutting machines which prepare them for shipment.

THE large stocks of SWEDOX which are waiting for your order represent more than mere tonnage. They consist of materials which have maintained a reputation for welding quality for many years. Every coil is made to a specification which has a national reputation for getting results. SWEDOX leadership, in fact, dates back to our pioneer work in welding wire research. You can be sure that the SWEDOX line includes a *proven* wire for your work.

Central Steel & Wire Company

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DAYTON, OHIO
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Garfield 3666

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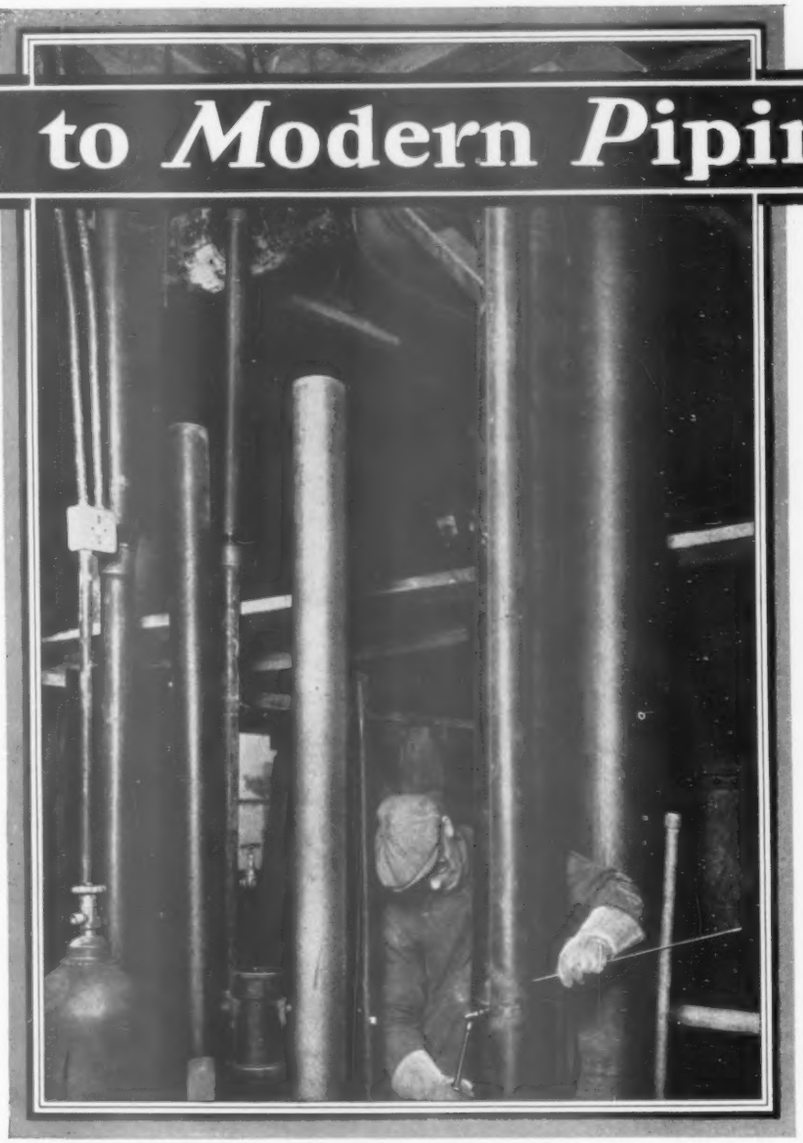
Whittier 6780

SWEDOX

WELDING RODS, WIRES and ELECTRODES

..As to Modern Piping..



PROGRESSIVE engineers recognize Oxwelded piping as the best modern practice. Oxwelded joints are leakproof. Maintenance costs are practically nil. The Oxwelded joint will last as long as the pipe itself. Costly special fittings are eliminated: fittings can be fabricated with cutting and welding blowpipes right on the job. Lighter pipe may often be used. Pipe may be purchased in longer lengths. Additions and changes may be made at lower cost.

"A properly made oxy-acetylene welded joint is as strong as the base metal, fully 100% efficient . . . ."

The Best of Everything for Oxwelding and Cutting

LINDE OXYGEN
The Linde Air Products Company

UNION CARBIDE
Union Carbide Sales Company

Prest-O-Lite
Dissolved Acetylene
The Prest-O-Lite Company, Inc.

Oxweld
Apparatus and Supplies
Oxweld Acetylene Company

Units of
UNION CARBIDE AND CARBON CORPORATION

General Offices
30 East 42nd Street, New York, N. Y.

Sales Offices
In principal cities of the country

64 Oxygen Plants—45 Acetylene Plants—154 Oxygen Warehouses—138 Apparatus Warehouses—235 Carbide Warehouses

HANDY & HARMAN
FOUNDED 1867
QUALITY SERVICE

The Problem of Brazing or Welding

Thin Sections

Thin sections of Extruded Bronze or of Copper, Brass, Monel Metal or even very thin Steel cannot safely withstand the high-temperature torch flame (1650 to 2100 deg. Fahr.) required for flowing the bronze or brass welding rod or brazing metal:

*Joint, butted at the miter, brazed with Handy Silver Solder, and bent cold through 270° arc, as shown.

BUT—

Handy Silver Solder

can be safely used, even on the most delicate work—

BECAUSE—

Handy Silver Solder containing 60% silver flows at 1325° F. and our 20% silver formula at 1500° F. In between are other guaranteed "Handy" compositions with intermediate flow-points.

Silver Solder Works Faster

Unit labor cost is less, with "Handy" Silver Solders, because they *work faster*—greatly increasing the output per man.

Make neat, strong joints, that require a minimum of finishing time and labor.

"Handy Book of Silver Solder W"

shows a multitude of other ways in which "Handy" Silver Solders solve metal working problems. Write for your copy.

HANDY & HARMAN

57 William Street : New York, N. Y.

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Roebling

Welding Wire

Economy in time and efficiency in strength of welding by both Gas and Electric in the manufacture of many standard products; structural steel fabrication; building up and bonding steel rails; and repair of broken mechanical parts, have been proven beyond question.

Roebling Welding Wire is used where only the highest quality is acceptable. It conforms to all standard specifications in every detail and produces sound welds with the least trouble in welding.

Samples and Catalog A-529 will gladly be sent upon request.

John A. Roebling's Sons Company
Trenton, New Jersey.

The Greatest Return on Your Investment

ONLY carbide which conforms to the most rigid standards of quality and uniformity is shipped to Union Carbide users.

As a result of these exacting standards, Union Carbide yields the most gas per pound—the greatest return on your carbide investment.

UNION CARBIDE SALES COMPANY

Unit of Union Carbide and Carbon Corporation

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New York Carbide and Carbon Bldg. | Chicago Carbide and Carbon Bldg. | San Francisco Adam Grant Bldg.

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UNION CARBIDE

Economy
Permanency

Let Thermit Solve Your Heavy Welding Problem

Thermit Welding is the commonly accepted method of joining rails in electric railway tracks. It is used for welding rails on approximately 85% of the track construction on the larger street railway properties.

Thermit Welding is standard in most of the large steel mills for welding heavy sections and for building up worn parts. The Thermit process is the most economical and permanent method of doing such work. In manufacturing processes where large castings are required the method of making smaller units and welding them together to make a completed job is the most economical way of doing the work.

In Marine Welding, Thermit is the accepted method of welding stern frames, rudder parts and similar sections and is accepted by Lloyds and the other prominent bureaus.

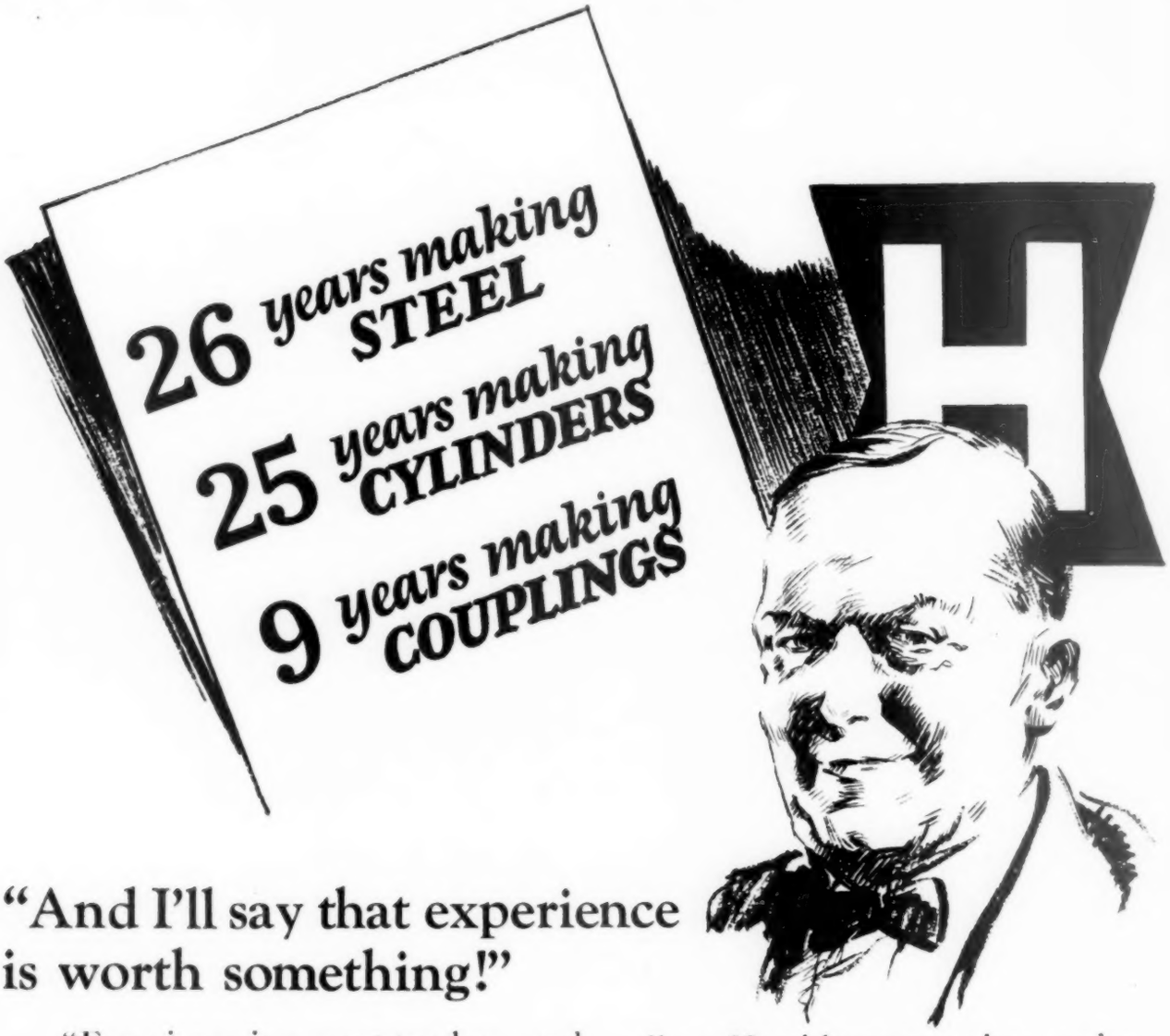
Thermit Welding has for years been considered the best and most economical method of welding locomotive frames and with the larger frames now coming into use it is practically the only method of satisfactorily welding these heavy sections.

Thermit Welding is found the most economical method in many industrial plants for welding crankshafts and other heavy sections. Jobbing shops are maintained in many of the important cities where Thermit Welding can be taken care of promptly.

Write for information regarding your welding problems.

METAL & THERMIT CORPORATION
120 Broadway, New York

Pittsburgh Toronto Boston
Chicago S. San Francisco



"And I'll say that experience is worth something!"

"Experience is a great teacher—and a great mark in favor of the company that takes care of your steel, cylinder and coupling requirements. Especially when that experience has been gained in serving America's large users and exacting buyers. And if you don't believe me, just call on Harrisburg next time you're in the market.

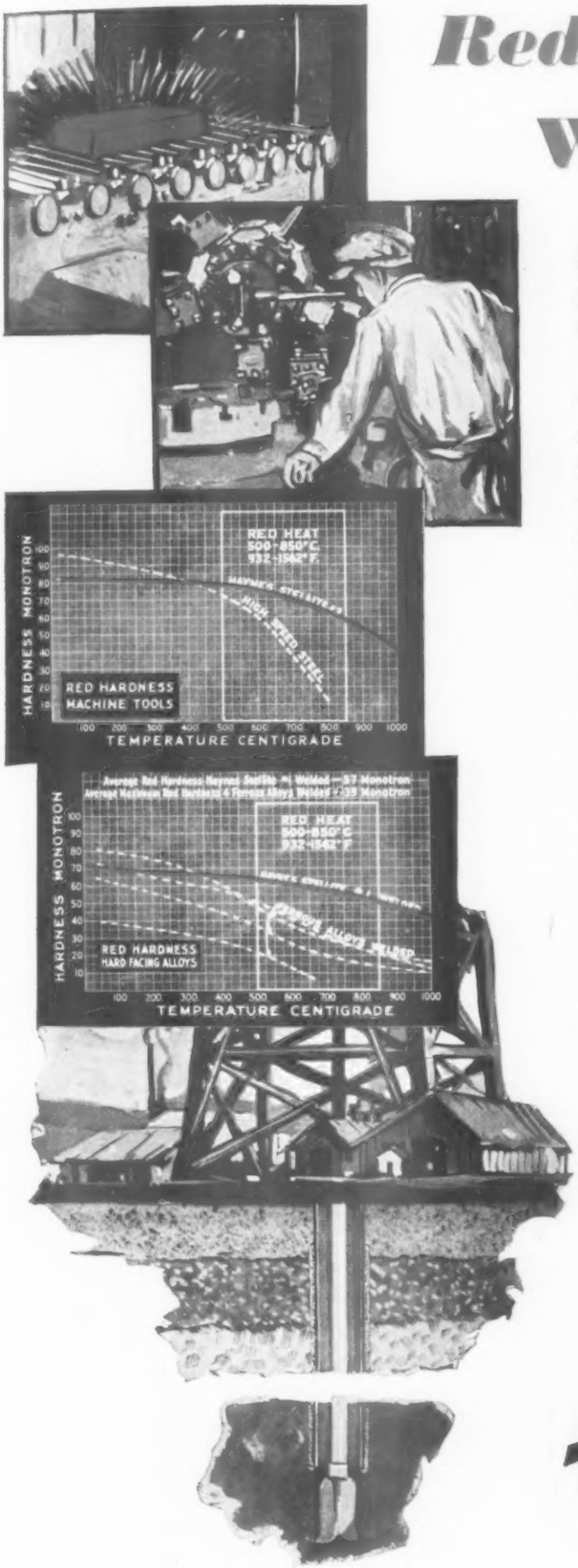
"There's a company for you! A company that owns and operates its own open hearth furnaces, rolling mills and forge shops — and knows how to use 'em to the best advantage of all their customers."

Your inquiry will quickly show how satisfactorily Harrisburg will meet your requirements in *Alloy Steels in Slabs, Billets, Bars, Shapes, and Forgings. Couplings, Cylinders, Pipe Coils and Bends.*

HARRISBURG PIPE & PIPE BENDING CO.
Harrisburg, Pa.

Fully Equipped with Our Own Open Hearth Furnaces, Rolling Mills and Forge Shops
Makers of Alloy Steels in Slabs, Billets, Bars, Strips, Shapes and Hollow Forgings; Pipe Coils and Bends, Couplings and Cylinders

HARRISBURG



Red Hardness— What Good Is It?

ALL mechanical operations absorb energy and produce heat that is concentrated on surfaces and edges resulting in high local temperatures.

These temperatures are localized in small volumes of metal and may not be visible, but when measured by scientific apparatus, they are often found to be over 900° Fahrenheit. Consequently the *cutting edges and wearing surfaces* of metal cutting tools, pulverizer parts, dipper bucket teeth, grinder rings, oil well drilling tools, and similar machine parts do this work while at a *red heat.*

Hardness is of no value unless it is possessed by an alloy when under actual operating conditions. It is RED HARDNESS and not cold hardness that establishes the value of an alloy as a cutting tool or wear resisting material.

RED HARDNESS is only another name for the ability to resist severe abrasion.

[This is the second of a series of three Ads on this interesting subject—watch for the next one]

HAYNES STELLITE COMPANY

Unit of Union Carbide and Carbon Corporation

UCC

DISTRICT SALES OFFICES

Chicago—Carbide and Carbon Bldg. Cleveland—628 Keith Bldg.
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General Offices—Kokomo, Indiana

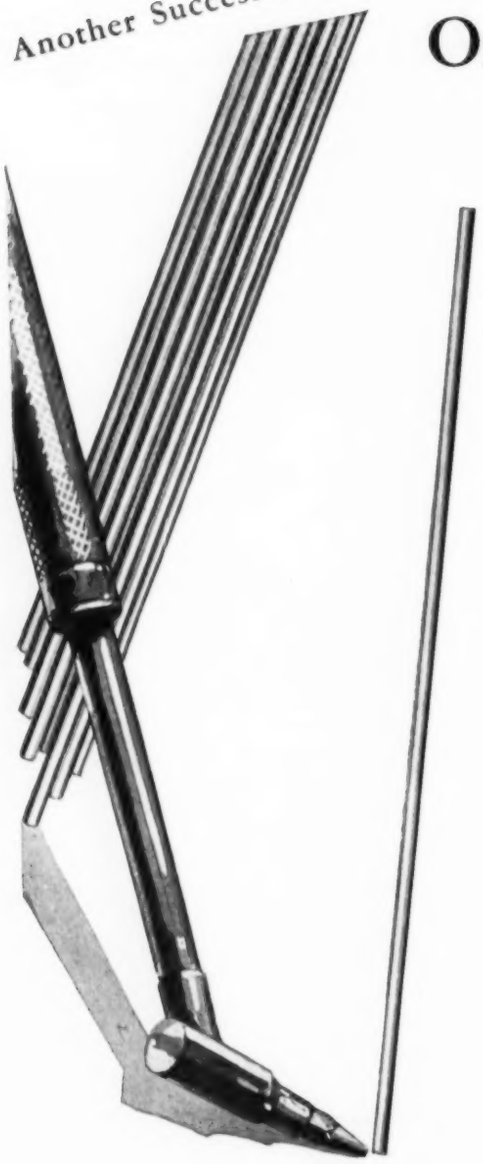
Haynes Stellite welding rod is also available from any of the 28 District Sales Offices of Oxweld Acetylene Company

HAYNES STELLITE

Introducing

Another Successful Union Carbide and Carbon Research Laboratories Development

Oxweld No. 21 High Strength Bronze Welding Rod



SUPERIOR for all bronze-welding operations—equally adaptable for steel, cast iron or copper alloys—produces a sound, fine-grained weld metal of superior qualities of strength, toughness, ductility and freedom from porosity.

Oxweld No. 21 High Strength Bronze Welding Rod requires less time to apply and less oxygen and acetylene. It makes high strength bronze welds easier and cheaper.

This new rod is easily worked. It can be more rapidly tinned on a steel or cast iron surface. It has a low melting point—melts and freezes quickly and evenly. Remelting has no effect on either the quality or appearance of the finish weld.

Ask any Oxweld representative for the whole story. Or, just order a supply from the nearest Oxweld warehouse.

OXWELD

WELDING AND CUTTING APPARATUS AND SUPPLIES

OXWELD ACETYLENE COMPANY

Unit of Union Carbide and Carbon Corporation

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STOCKS IN 38 CITIES

Tested

for Highest Quality *and* Proved Economy

Gas Welding Rods

Electrodes

HERE is insurance against lost time and spoilt work. Here are welding wire and electrodes that enable the skilled welder to secure perfect fusion, save labor, and reduce the consumption of gas or electricity as well.

Premier Welding Wire and electrodes are shop tested to assure quality, economy and their exact application to the type of work they are intended for.

You will find them to be free flowing, uniform in structure and without impurities. There is a type for every purpose. Write us about your welding problems.

American Steel & Wire Company

Subsidiary of United States Steel Corporation

Sales Offices: Atlanta, Baltimore, Birmingham, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Denver, Detroit, Kansas City, Milwaukee, Memphis, Minneapolis-St. Paul, Oklahoma City, New York, Philadelphia, Pittsburgh, Salt Lake City, St. Louis, Wilkes-Barre, Worcester

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PREMIER

TESTED

WELDING WIRES

Take Advantage of the Specialized Service that goes with

HOLLUP

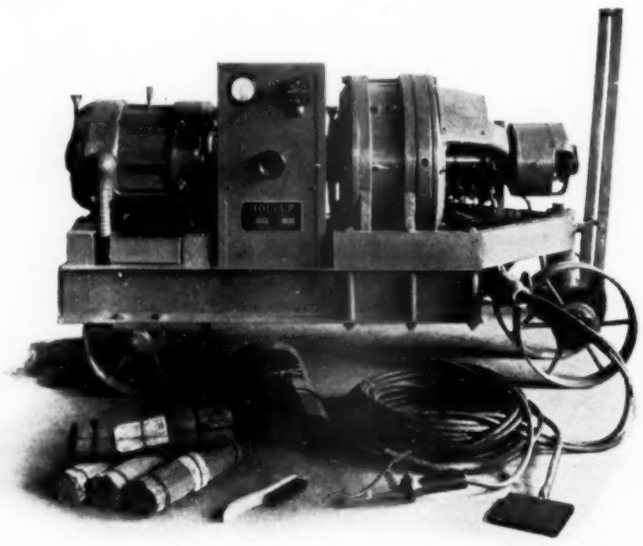
WELDING PRODUCTS

THERE is a double significance to the fact that Hollup staff engineers are able and ready to help you work out the most practical solution to your welding problems. Their combined practical experience as engineers and as welders has prepared them not only to work with you in your own plant on problems of design and procedure, but also to design a welding generator, a variety of electrodes and a line of accessories with the welder's every-day working requirements constantly in mind.

The result shows up on the job. One might easily guess from the performance of Hollup generators and Hollup electrodes that Hollup designers know from actual experience what it takes to make a sound, strong, ductile weld. And engineers from the Hollup plant are always ready on short notice to help you get the best results and the highest efficiency out of your welding equipment.

You are urged to take advantage of this service.

This illustration shows a portable motor-driven Hollup Welder. These machines are also furnished with gas engine drive, for use where power is not available.



For detailed information on all Hollup Welding Products, consult our Bulletin 131. It describes the machines, electrodes and every accessory for the arc welder.

HOLLUP CORPORATION

3333 West 48th Place
Chicago

269-37th Street
Brooklyn

{ONE OF A SERIES SHOWING AMERICAN TRANSFORMERS IN MANY DIVERSIFIED INDUSTRIES}

WELDING SPEEDS PRODUCTION!

WELDING in the automobile field is an acknowledged success. Leading manufacturers attribute at least two major improvements directly to its introduction in their field:

1. Increased production (with increased profits)
2. Stronger, more rigid chassis, frames and bodies.

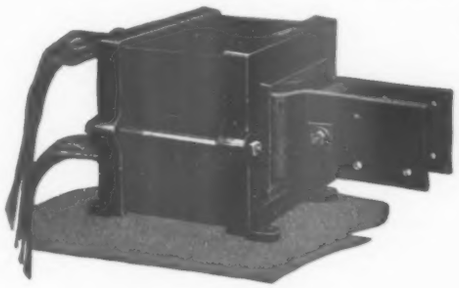
The welding equipment for this purpose must be chosen with care. Of special importance is the transformer used, for upon its efficient performance depends the strength of the weld.

Three factors should be given first consideration when choosing the transformer:

1. Efficiency—(wide range of voltage with a dependable control board)
2. Reliability—(24 hour service, without interruption, if necessary)
3. Economy—(long life with a minimum of repairs)

American Transformers are built to meet the individual requirements of welding machines for spot, seam, arc, flash and other welding methods. Bulletin 1040-W gives complete description of type CF which is used mainly for spot welding.

There is an American Transformer for every industrial service. Let our engineers advise you on *your* problem—no obligation, of course.



American Transformer
TYPE CF for welding machines

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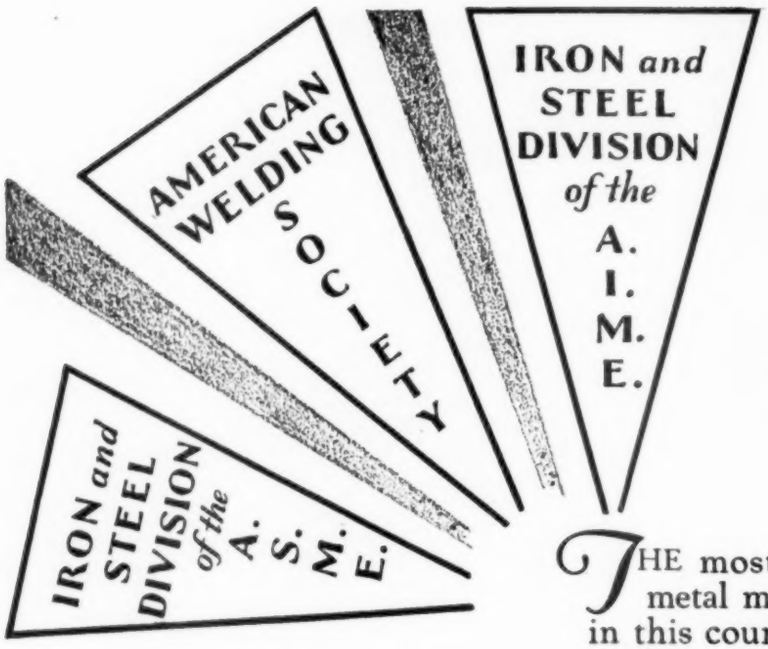


NATIONAL METAL CONGRESS

THE most important gathering of metal men ever brought together in this country or the world will assemble for the National Metal Congress in Cleveland during the week of September 9 to attend the annual meetings of the five cooperating societies and to visit the eleventh annual

NATIONAL METAL EXPOSITION

Every man whose work touches in any way on the production, fabrication, treatment or use of metals in any form should be there. If you haven't made your hotel reservations, do so today. You can't afford to miss it.

DON'T FORGET

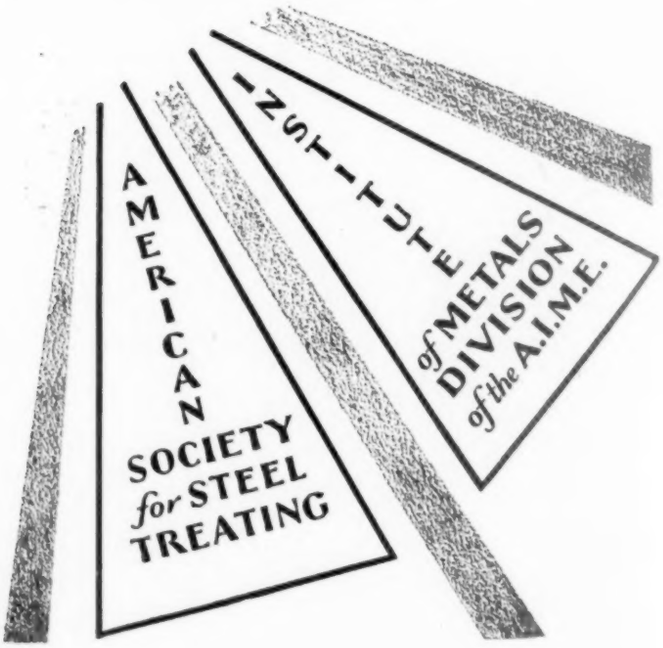
—The Events—
National Metal Congress
and
National Metal Exposition

—The Place—
Public Auditorium

—The City—
Cleveland

—The Days—
September 9, 10, 11, 12, 13

and above all don't forget to bring the key men of your organization with you.



"To Me, National Metal Congress Week is the Most Profitable Week in the Year"

"FIRST, from a purely dollars and cents angle, we get more new ideas there for saving time and labor, for speeding up production and generally decreasing production costs, than from any other source.

"Second, we have picked up several ideas at previous expositions that resulted in new products for us and improvements on ones already in our line.

"And, third, but to me just as important, we always come back just bubbling over with a new enthusiasm for our jobs. We meet and talk to all the leaders in our field. We get their ideas and give them ours. Together we iron out the little differences that are always popping up.

"No sir, you couldn't keep us away from the National Metal Congress."

You'll feel that way, too. So be sure to be in

CLEVELAND
the week of September 9

NATIONAL METAL EXPOSITION

IRON *and* STEEL DIVISION *of the* A. S. M. E.

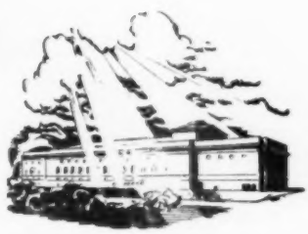
AMERICAN WELDING SOCIETY

AMERICAN SOCIETY *for* STEEL TREATING

INSTITUTE *of* METALS DIVISION *of the* A. I. M. E.

IRON *and* STEEL DIVISION *of the* A. I. M. E.

Time is getting short. Make your hotel reservations now. Over 50,000 people attended last year's Congress. More will be in Cleveland this year. Wire your favorite hotel today and then you'll be sure of the accommodations you want.



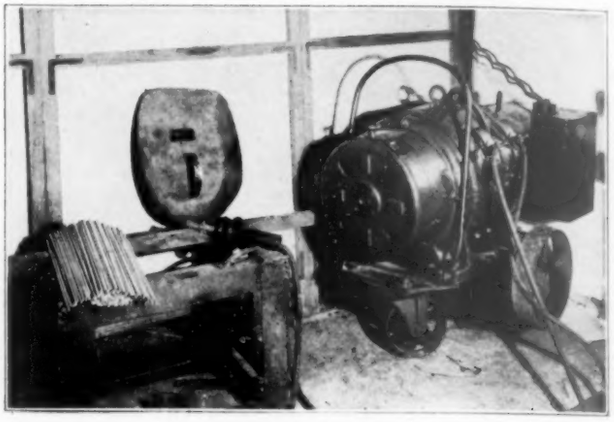
That National Metal Congress is continually increasing in its importance to the metal world is evidenced by the fact that two new metal societies—the Iron and Steel Division of the A. I. M. E. and the Iron and Steel Division of the A. S. M. E.—will hold this year in Cleveland their annual meetings concurrently with those of Institute of Metals, American Welding Society and American Society for Steel Treating.

On Display at National Metal Exposition, Cleveland Ohio, September 9-13

THE FUZON LINE OF ARC WELDERS

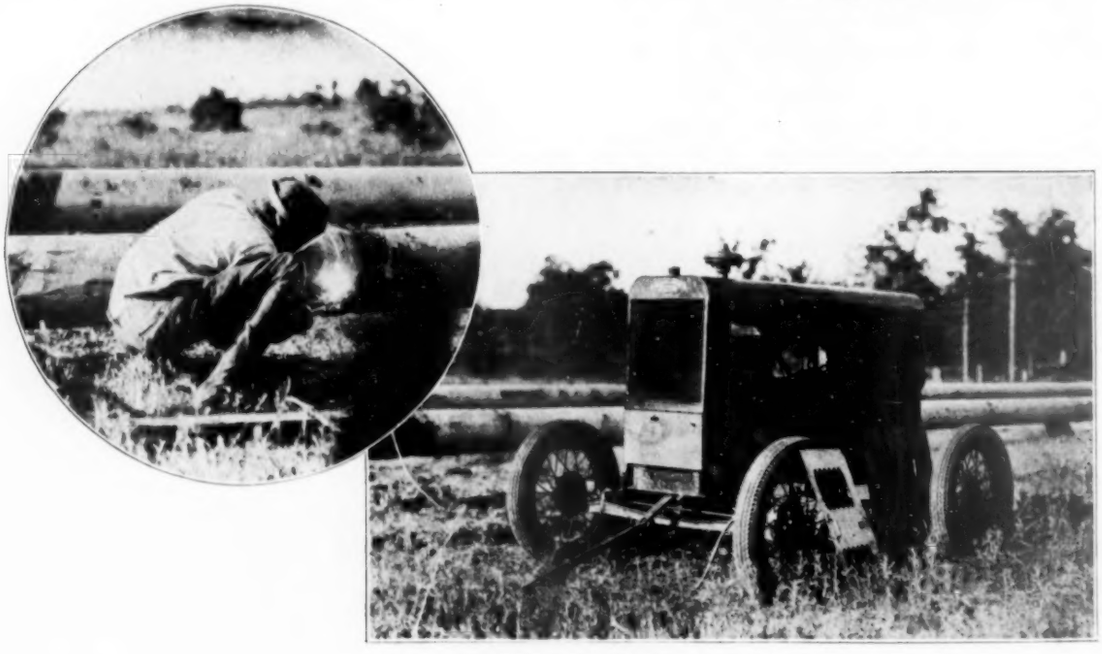
On the Street

300 Ampere Motor Generator Unit Designed to Operate on 550 Volts for Street Railway Welding



In the Shop

Fuzon Motor Generator Units are Standard Equipment in Many Shops for Production, Maintenance, and Salvage Work



In the Field

The Fuzon gasoline engine driven unit is a truly portable complete arc welding outfit. It can be pulled over rough country at 30 miles per hour. It is furnished in two sizes, 200 or 300 amperes, and with pneumatic or solid rubber tires.

Write for Detailed Specifications

FUSION WELDING CORPORATION

—MANUFACTURERS OF WELDING EQUIPMENT AND SUPPLIES—

FUZON EQUIPMENT

103RD STREET AND TORRENCE AVENUE, CHICAGO

A SUBSIDIARY OF THE CHICAGO STEEL & WIRE COMPANY

Weldite WELDING ROD

"Three Generations of Brass Making"
Do Make a Difference in the Finished Product

Mueller
WELDING
BRONZE ROD

Mueller
Makes

Red Tip Brass Rod
Brass and Copper Forgings
Nickel Silver Rod and Forgings
Tuf-Stuf Rod and Forgings
(Corrosion Resisting Metal)
Brass Castings
Brass Screw Machine Parts
Mueller Blue Tip Bronze Rod
Brass and Copper Seamless Tubing
Mueller Blue Tip Bronze Welding Rod
"600" Bearing Metal
Airplane Fittings
Electric Refrigeration Valves and Fittings

IF you have never used Mueller Welding Bronze Rod you are overlooking a product that will enable you to do better work and to do it in less time.

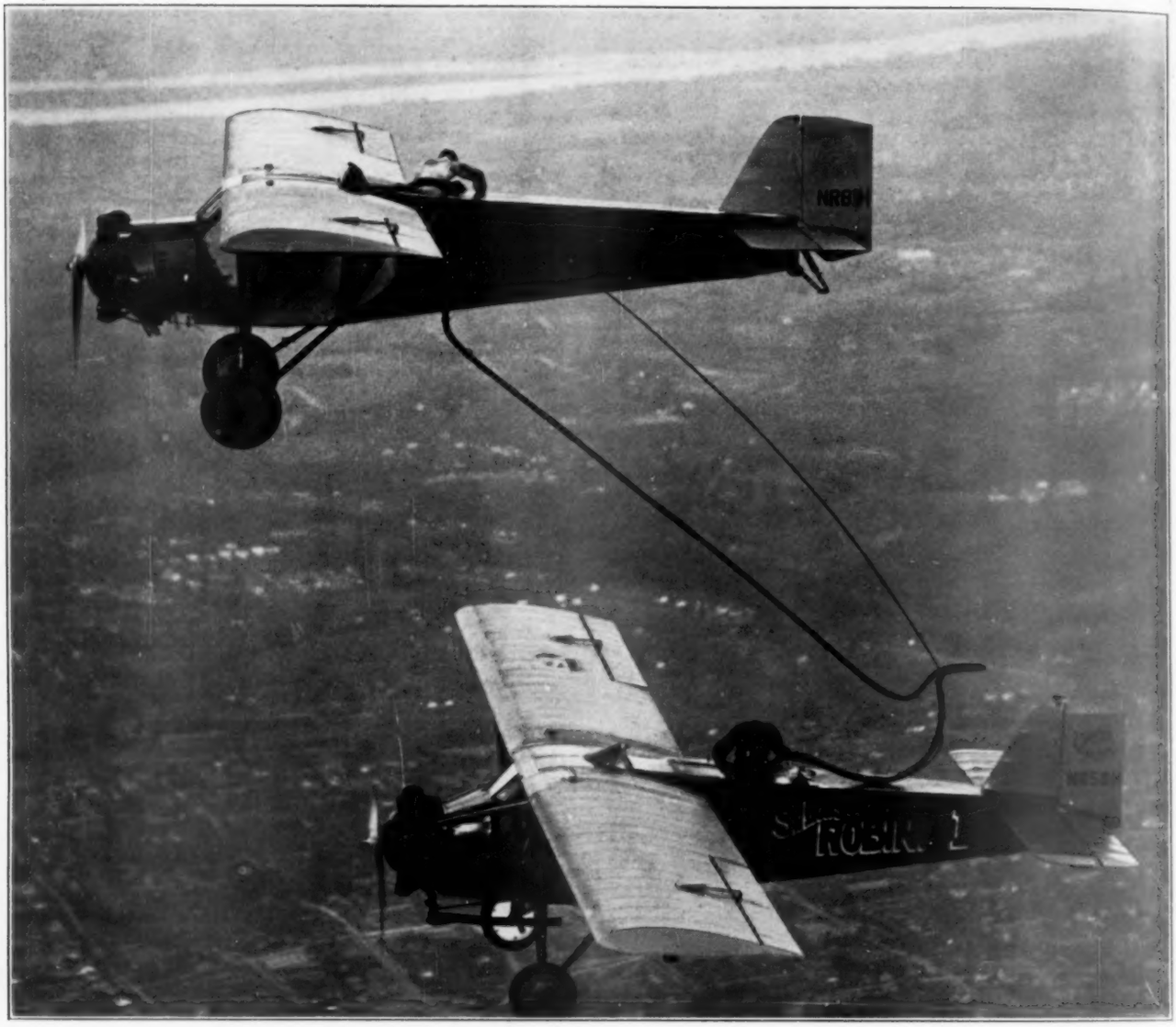
Quality isn't left to chance in Mueller manufacture. Careful analysis of each heat as it is poured insures a uniform product.

Mueller Welding Bronze Rod makes sound, strong, non-porous welds. It flows evenly and freely. Absence of porosity eliminates sputtering and explosions.

Find out for yourself the Quality of Mueller Welding Bronze Rod. We'll gladly mail you a generous sample free. Drop us a line with your address, we'll do the rest.

Mueller Brass Co.
PORT HURON MICHIGAN
DETROIT DISTRICT

Mueller Brass
THREE GENERATIONS OF BRASS MAKING



WHAT A MAGNIFICENT ACHIEVEMENT OF HUMAN ENDURANCE

—of engineering ability and welding skill.

Victor is proud to know that Victor equipment was used exclusively in the construction of the "St. Louis Robin"—

Proud to have Curtiss-Robertson Airplane Manufacturing Co. and other large airplane manufacturers standardize on Victor apparatus.

VICTOR WELDING EQUIPMENT CO.

844 Folsom Street **San Francisco, Calif.**

EDITORIAL

The Proof of the Pudding

THE present interest in non-destructive tests is certainly justified by present conditions and also by the trend of modern industrial developments. There is every indication that the enormous sums which have been expended for scientific research in the fields of manufacturing have proven a wise investment and even though it may take a great deal of such research to develop really satisfactory non-destructive tests for welds, there is little doubt about their being put to good use in the metal working fields. At the same time it is evident that the perfection of such tests is non-essential to the progress of welding in industry. It is true that there are many engineers of the old school whose first experiences with welding date back to the earliest days of our industry when it was demonstrated that a good looking deposit might actually be a very inferior weld. From that day to this they have treasured the thought that welding could not be accepted as a satisfactory means of joining steel until there should be developed methods of inspection which would not destroy the welded article. It has not worked out that way. There has not been very much progress made in the development of non-destructive tests but the progress which has been made in finding new and satisfactory methods of using welding in industry is one of the wonders of the present decade. Ten years ago there were few men even in the welding industry itself who thought that welding might ever claim a place in building and bridge construction. It has not only gained a place in that field but the process has been given wide acclaim in some of the biggest newspapers in the country and is recognized already in a number of building codes. Another accomplishment is found in the chemical industry. A survey was recently made of two hundred manufacturers of chemical equipment. About ninety per cent of these called attention in their catalogs to the fact that their equipment was welded. Now, from the development point of view, this comes close to being a chemical age, since chemical engineers are responsible for such a large percentage of revolutionary methods of production. A wide adoption of welding for the equipment used in various chemical processes is therefore an outstanding tribute to the dependability of the processes. To make up a complete list of such practical testimony of the dependability of welded joints would require a word picture of nearly every important industry in the world. Practically all of this progress has been made in the application of fusion welding in the short space of about twenty years, without the aid of non-destructive tests to prove that it could be done. Whatever such tests can do to speed up the future development of welding will certainly be welcomed. They would evidently serve to overcome a considerable amount of opposition which is based upon prejudice. Meanwhile there is no doubt about progress being made consistently in multiplying the applications of welding. This is because so many men in industry have learned the secret of producing dependable welds; which is to use good materials and properly trained workmen, and provide supervisors who know how to judge workmanship on a fundamental basis.

Put Them to Work

HERE and there in all kinds of plants it is possible to find a good many idle pieces of welding apparatus, torches, motor generators, transformers, spot welders and butt welders. There is always, of course, a reason why this equipment is idle at times. It may have been installed for special operations which are not continuously required. It may have fallen into disuse because certain products of the plant have been abandoned. It may be standing there so as to be instantly available in case of a breakdown of important parts of plant equipment. It may even have been discarded because some inefficient operator failed to get the results which were expectd from the equipment. There are plenty of other possible reasons, even in cases where the idle equipment does not represent a mistake on anybody's part; that is, it may be good judgment to have it there. However, there is always the suggestion that a piece of welding equipment has a considerable amount of earning capacity. A well-trained, hard-working welder who needed work could more than likely find profitable things for the greater portion of all this idle equipment to do. This suggests that where welding equipment is out working some enterprising member of the organization might do well to find out whether there is not some real useful and profitable occupation for it. A plant executive who really knows how much economy there is in a busy welding outfit would no more think of leaving it idle than a good sales-manager would consider keeping a real productive salesman sitting on a soft cushion in the office waiting for someone to come in and ask to be waited on by the salesman.

When Welding Goes to College

THE approach of the opening days for colleges and universities will serve as a reminder of the welding conferences which will probably be held during the coming school year. A few of these conferences have been so successfully organized and conducted, and received such encouraging support from all quarters, that they have definitely become annual events. These conferences are the subject of great interest to manufacturers of welding equipment and welding materials because they offer such an excellent opportunity to present welding in a favorable light to the Engineering Departments of our best educational institutions. More and more engineers starting out to prepare themselves for professional careers in industry are getting, to some extent, acquainted with the possibilities of welding, and are not so inclined to stand in its way as are the older members of the profession, who learned nothing whatever about it during their periods of training. This is a somewhat indirect benefit to the industry from such conferences, but never the less it is worth thinking about seriously. Possibly there are more direct and more immediate benefits resulting from the fact that these conferences draw a great deal of attendance from men in the districts close by the schools where such conferences are held. Such a group is, of course, largely made up of men who not only are acquainted with welding but are eager to learn more about its use. As a result of their attendance, they can reasonably be expected to put new ideas to work, if the program provides new ideas of a kind which can be used. This is something to think about for the speakers. The continuation of these conferences and the benefits which come from them will depend a good deal upon how much good they do for the men who leave their shops to spend two or three days listening to a series of papers. Let us hope that this year there will be more welding conferences than ever before. If this turns out to be the case, there is one thing which will have a very important bearing on the success of such programs, that is, the question as to whether or not the speakers will all make an effort to vizualize their audiences in advance; whether they will make a brief survey of the districts from which men will come to listen to them, and determine what phases of welding will be the most valuable to those men, and use the speaking time to furnish the audiences with information which can be taken home and used. Incidentally, it is by taking pains to prepare this kind of paper that the speaker accomplishes the greatest possible amount of good both for his company and the institution which sponsors the conferences.

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DR. A. KREBS CONTINUES:

WHY FABRICATION WILL MAKE HISTORY

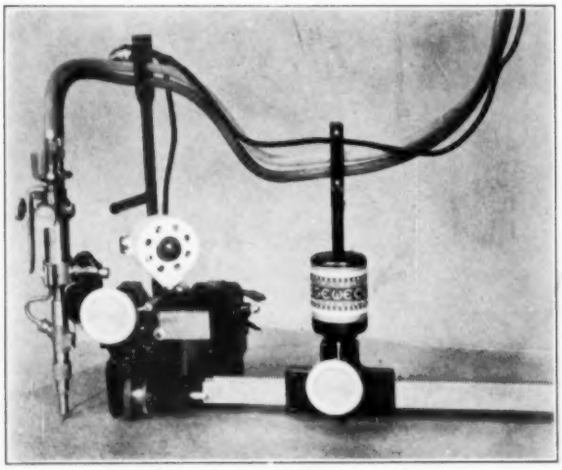
FABRICATING, OR REPLACING CASTINGS BY STEEL ELEMENTS CUT TO SHAPE WITH AUTOMATIC CUTTING MACHINES AND STRUCTURED TOGETHER BY WELDING, NOT ONLY SIMPLIFIES AND SPEEDS UP THE MANUFACTURE OF MACHINERY AND REDUCES COST AND FLOOR SPACE DIRECTLY, BUT IT ALSO PRODUCES SHORT CUTS THROUGH MANY OTHER DEPARTMENTS. PURCHASING IS MADE SIMPLER AND SO IS STOCK KEEPING, AS IT IS MUCH SIMPLER TO ORDER, KEEP, STORE AND MAINTAIN PLATES AND SHAPES, THAN TO ORDER, STORE, KEEP AND MAINTAIN A STOCK OF VARIETIES OF CASTINGS. IT SHORT CUTS THROUGH THE FOUNDRY ELIMINATING MANY PIECES FORMERLY CAST, AND DOES AWAY WITH MANY PATTERNS, THEIR STORING AND THEIR MAINTENANCE. IT SHORT CUTS THE MACHINING DEPARTMENT BECAUSE FABRICATED MACHINERY COMES ALREADY OUT SO CORRECT, THAT IT ONLY NEEDS SLIGHT FINISHING.

IN THIS WAY A MUCH LARGER PRODUCTION CAN BE TAKEN CARE OF BY THE EXISTING CHANNELS. WE ALL KNOW THAT NO STATE OR MUNICIPALITY COULD AFFORD BUILDING HIGHWAYS FOR CARS WITH A SPEED LIMIT OF 20 MILES AN HOUR. SIMILARLY INDUSTRIALS COULD NOT AFFORD TO EXTEND MANUFACTURING AND ADMINISTRATIVE FACILITIES IN PROPORTION TO THE FAST INCREASING DEMAND FOR GOODS IF OLD METHODS PREVAIL.

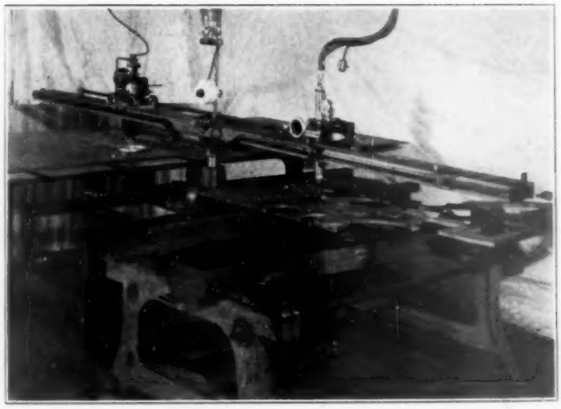
FABRICATING LIBERATES QUITE A RANGE OF FACILITIES FOR NEW PURPOSES AND IS THEREFORE BOUND TO MAKE HISTORY.

AT SOME FUTURE TIME THESE COMMON SENSE WRITE-UPS WILL BE CONTINUED.

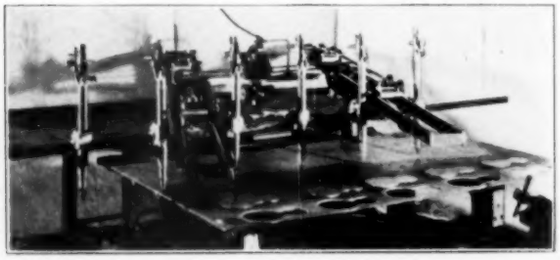
WE ALSO RECOMMEND OUR STANDARD WELDING AND CUTTING EQUIPMENTS AS WELL AS WELDING AND CUTTING TORCHES AND OUR REMARKABLE REGULATORS.

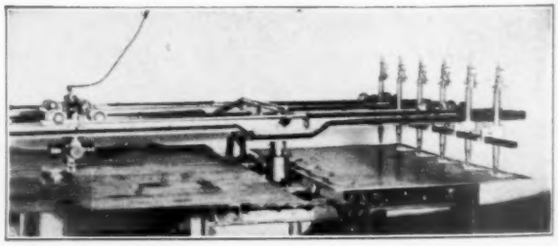


AUTOMATIC CIRCLE CUTTING MACHINE 24" DIA. AND UP.



"GEWECO UNIVERSAL" FOR SINGLE TORCH OPERATION (A REPEAT ORDER).





"GEWECO DUPLEX" WORKING WITH 6 TORCHES.

Better Milk Machinery

Durability, Efficiency and Sanitation Features of All Kinds of Milk Machinery Increased by Judicious Use of Welding in Its Manufacture

MODERNIZED equipment and machinery for the handling of milk and for the manufacture of milk products is now more or less of an old story in the milk industry and the allied industries. It is even taken as a matter of course by the ultimate consumer. Nobody knows better than the housewife that the days of the cracker barrel and the unsanitary old-fashioned milk can are over, so the public not only takes up-to-date equipment as a matter of fact in these fields but practically insists that it should be used. It is of course true that high speed production methods in these industries are necessary to the reduction of manufacturing and distributing costs. The modern dairy or ice cream manufacturer does not hesitate to install equipment comparable in efficiency to that of the automobile plant. These industries also recognize the virtue of the demands of health departments for proper sanitary control as a safeguard to good will amongst their customers. Consequently the combined demand for automatic and time saving machinery, with the necessity for the nearest possible approach to perfect sanitation has led to the development of machinery and equipment which probably was not dreamed of twenty years ago.

It is not strange that the highest quality equipment of this type should call for the use of welding to a considerable extent in its fabrication. Manufacturers of equipment for these industries when contemplating a design of entirely new types of machinery have not been handicapped by traditional forms of construction and consequently have looked over the market for the best possible materials to use in construction and have thoroughly investigated all methods of fabrication. The necessity for cleanliness and resistance to corrosion has indicated the need, in a great many places, of other materials than ordinary sheet steel and also for a type of joint which did not leave the slightest crack or crevice in which bacteria might accumulate. The first requirement has been met by the selection of such materials as stainless steel and Monel metal for raw material, and the second requirement has been met by the use of welding to produce seams free from laps, rivets or other possible locations for contaminating material.

As an indication of the many purposes served by welded joints it is interesting to note that the adoption of welding as a means of making some of the necessary joints in equipment of this type and furnishing careful control over the operations will lead to a constantly increasing list of duties for the welder. The particular advantages of welding in the production of better milk handling equipment and the wide range of usefulness of welding equipment in the manufacture

Fig. 1. Mojonnier Model B, Double Track Conveyor. Welded Construction Used Extensively in This Product.

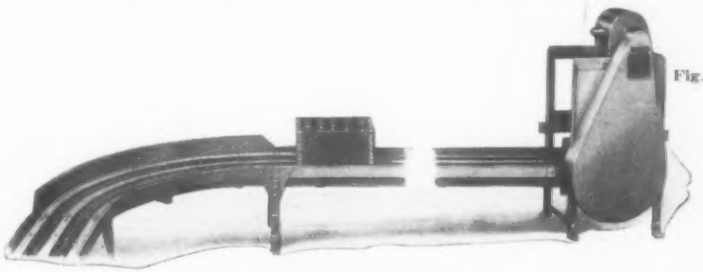


Fig. 2. Bottle Case Conveyor.

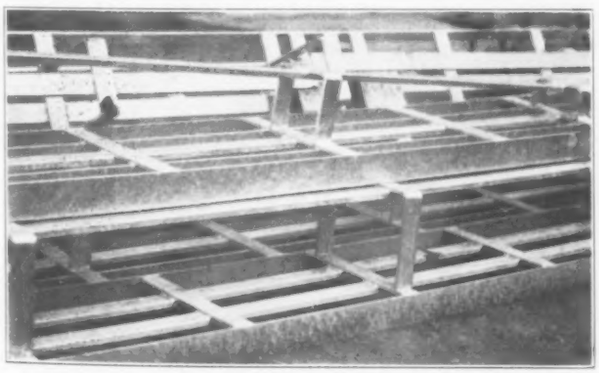


Fig. 3. How Welding Is Used in Conveyor of Framework.

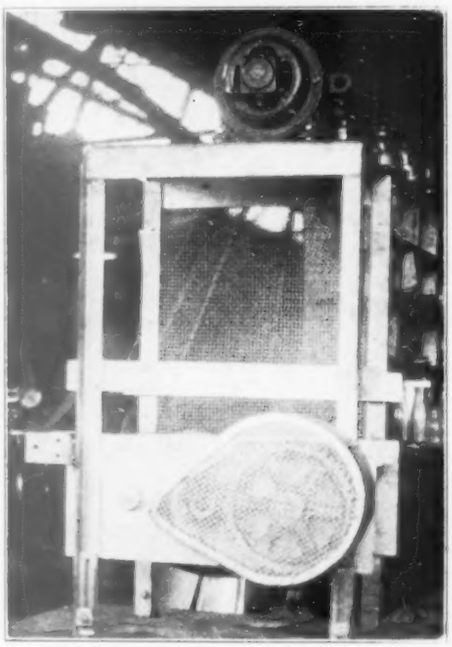


Fig. 4. Power Unit. Welded Into a Rigid Unit.

of this type of machinery is splendidly illustrated in the experience of Mojonnier Bros. of Chicago. This company manufactures an extensive line of conveying equipment, packaging equipment, testing equipment, etc., for the dairy industry. Their products are internationally known, to the extent that they have been able to check the claim that the sun never sets on their equipment; and improvements in the Mojonnier line during recent years have been of a nature which constantly favored the use of fusion welding in the assembly processes. Welding having been applied to some extent from necessity for some time has now proven to be so satisfactory from every standpoint as to recommend its use in place of other assembling methods over a constantly increasing range of operations so that in a couple of years under the direction of Mr. Oliver W. Mojonnier, Superintendent, and Martin Olsen, Welding Supervisor, the personnel of the welding department has multiplied rapidly and there have been considerable increases in the amount of welding equipment in constant use. This equipment includes all three processes, oxy-acetylene, electric-arc and electric resistance welding.

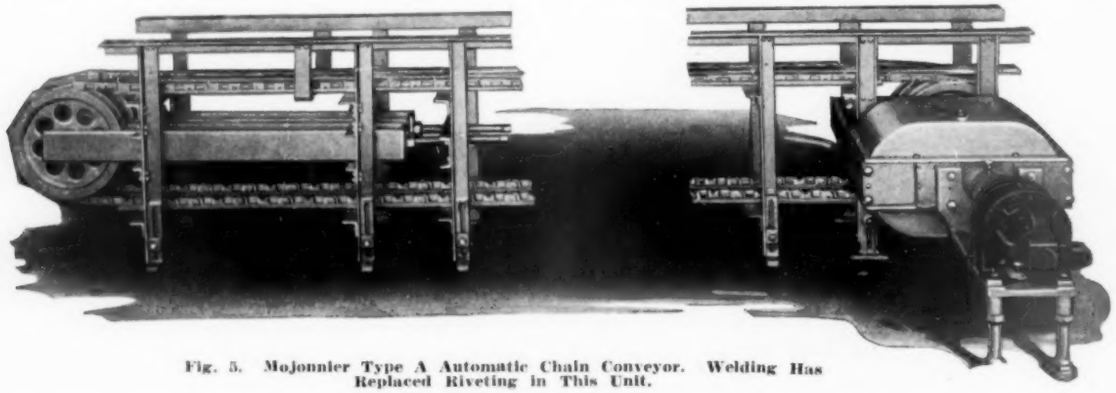


Fig. 5. Mojonnier Type A Automatic Chain Conveyor. Welding Has Replaced Riveting in This Unit.

Reference to the illustrations of a few popular Mojonnier products would indicate what a great number of different types of design are involved in the manufacture of this interesting equipment and why the welding department must be familiar with the proper methods of application of the different processes to materials other than ordinary steel. Figure 1 is a photograph of an installation referred to as a Double-Track Mojonnier Conveyor. This installation is in a room used for storage for unwashed milk bottles. It is obvious from the picture that cases may be put on either conveyor at any point and carried to the washer. Where equipment of this kind is installed the conveyor system handles cases from the time they are unloaded from the wagons until they are ready to be loaded on again. After cases have been emptied at the bottle washer they continue on the conveyor, then the elevator carries them thru the washers to the floor above directly to the fillers. This sort of equipment means a minimum of labor involved in the handling of materials. Figure 2 is a simpler type of bottle case conveyor which is only single track. Its construction provides a uniform continuous forward motion. The bottle cases are brought automatically and steadily to the employees, enabling them to remain at their appointed tasks while the work is brought to them at an even rate. It is obvious that the labor saving of such equipment compared with hand trucking is tremendous. Materials are handled more smoothly so that there is less confusion and no breakage. Work is brought to the workman in a comfortable working position so that he can perform his duties with a minimum of effort. Another interesting piece of equipment is the automatic chain conveyor shown in Figure 5. This is made to operate in hardening rooms at temperature of —20° F., on loading platforms, and in other places where a conveyor is needed. It requires little attention and is said to be a great cost saver on such items as trucking, hand labor and refrigeration.

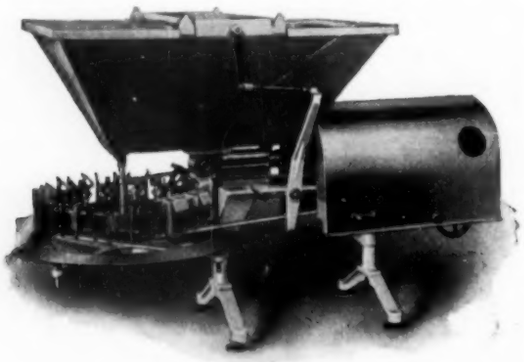


Fig. 6. Ice Cream Packaging Machine.

The part played by welding in the manufacture of this conveyor equipment is quite varied. A good deal of the light structural work of the equipment is arc-welded. A number of welded units are shown in Figure 3. The power unit container is a welded assembly of light structural shapes and light steel plate. Figure 4 illustrates one of these units. It can be seen in position at the right of Figure 2. Resistance welding is used in the fabrication of the conveyor chain. These chains are made of a special alloy and the assembling rivets are heated and upset in a water cooled electric resistance welder.

The complicated looking machine shown in Figure 6 is the Mojonnier Model "A" Ice Cream Packaging Machine. It is not as complicated in operation as it appears. The revolving feed table beneath the hopper contains a number of small parts because it is on this table that all kinds of small packages are filled with ice cream. The cartons are placed in holders, automatically brought to a filling position, and filled with measured quantities of ice cream. This piece of equipment enables the ice cream manufacturer to keep up with the modern trend of the public toward buying things of this sort in packages prepared under sanitary conditions rather than having such food dished out by more or less careless clerks. There is a considerable amount of welding involved in the manufacture of one of these machines.

For the preparation of bulk ice cream for delivery there is, of course, a need for equipment of much greater capacity. The Monel metal hopper shown in Figure 7 is a typical Mojonnier installation. The ice cream is fed from this hopper downward through welded monel metal pipes shown in Figure 8 to the conventional ice cream can; then they are carried on the conveyor into the hardening room through door shown at the left in Figure 8. Figure 9 is a photograph showing the welded construction of the hardening room door.

Other items of welded or partly welded construction are shown in Figures 10, 11, 12, and 13. Figure 14 is a photograph of the outer shell of what is called a "hot well." This

is made of stainless steel and the photograph serves to indicate the size of the shell. An interesting feature of this is that the bottom of this tank is too large to make from a single sheet. It was therefore necessary to make up the bottom from two pieces welded together and the bottom had to be dished after being welded. In the course of fabrication of one of these bottoms the dishing operation was handled by an outside shop and an inexperienced workman misjudged the stresses so that a number of cracks were produced in the sheet. None of these cracks, however, were produced in the welds. Some of them were along the line of welding but they were distributed well enough over the area to indicate that not only was the weld itself sufficiently strong but the welding operation had not injured the metal adjacent to the weld.

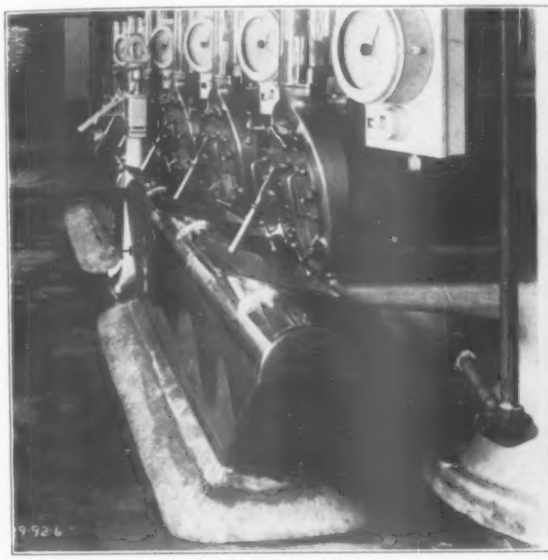


Fig. 7. Monel Metal Hopper.

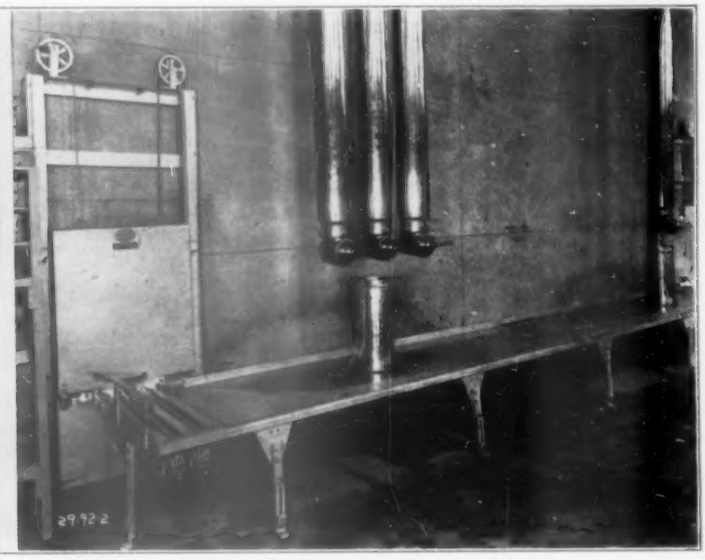


Fig. 8. Filler Tubes.

It has already been indicated that in the Mojonnier plant use is made of all of the electric processes. Oxy-acetylene welding is used in such work as the fabrication of the Monel metal tubes which lead from the ice cream hopper to the filling room. These are of 16-gauge Monel metal. They are from 6-inches to 10-inches in diameter and are soldered on the inside after welding. The torch is also used in the welding of acid containers. These are made of steel and have to be enameled after welding. Brick trays are made of steel, gas welded, and tinned. The torch is also used to a large extent in the reclamation of imperfect castings, in welding German silver, Monel metal, brass and bronze, in brazing copper, in the making of vacuum pans and in the brazing of copper kettles after they have been riveted. A great many steel and cast iron parts are also gas welded. Electric arc-welding is used on the conveyor system, structural work and the power unit doors, stainless steel hot wells and the pasteurizer, which has an iron water jacket lined with stainless steel. The Monel metal packaging machine hopper, the milk tester tank, which is made of 16-gauge steel and galvanized after welding, can washers, case washers, bottle filling machines which have parts of stainless steel, monel metal and low carbon steel bottle conveyors, filling plates and can dumps, are other arc-welding jobs. Spot welding is used on the chain rivets, on a great deal of sheet metal work where the design does not permit welding and soldering, on trays, parts of hoppers, whey tanks and some of the sheet metal which it is not possible to solder on both sides. When soldering cannot be done on both sides arc-welding is used. A recent development is the automatic arc-welding of the stainless steel vacuum tank, 3-foot in diameter and 15-feet high of 16-gauge Alleghany steel.

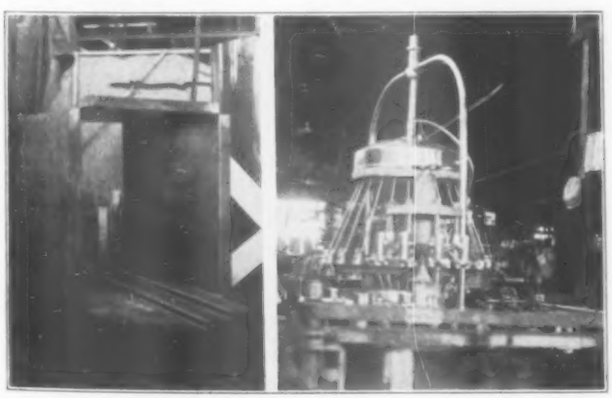


Fig. 9. Detail of Door Construction.
Fig. 10. Milk Bottle Filler.

Reference has been made to the combination of arc-welding with soldering. The procedure followed is to solder one-inch tacks, 6-inches apart, then arc-weld 1-inch tacks in the center of the spaces between the soldered tacks, grind off the bead, and then solder the whole seam.

It is also interesting to note that welding has been found so useful in production work. It is naturally put to good use in fabrication of a number of important parts of plant equipment such as cranes, the vibrating hammer, the coke chute, the sand blast piping equipment and in plant repairs, particularly on boilers.

It should be noted that the welding techniques have varied somewhat when work changes from ordinary mild steel to other classes of raw material. In this plant the Monel metal welding is mostly on 20 to 10 gauge material. It is welded with a 3/32-inch coated Wilson processed Monel metal wire, using a current of about 150 amperes and an average voltage of 50 volts with reverse polarity. The proper handling of this metal through the arc requires a little practice. Care must be taken to avoid the side-to-side weaving motion ordinarily used on steel tank work. Instead of this, the motion is more in a vertical plane and could better be described as a dipping motion. This motion serves the purpose of placing the deposited drop of hot metal directly into the pool which has been melted by the heat of the arc. This

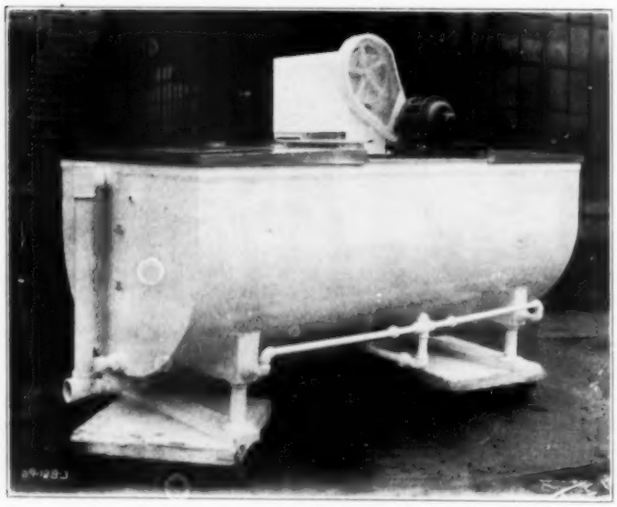


Fig. 11. Welded Milk Pasteurizer.

procedure avoids spattering and depositing metal on material which has not been raised to the fusing temperature, and results in a good sound deposit.

The thickness of stainless steel varies from 16-gauge to 10-gauge. On 10-gauge work a ⅛-inch coated Alleghany rod with 150 amperes at 32 volts is used. On the lighter gauges a 3/32-inch electrode with 100 amperes and 50 volts is

Fig. 12. Interior of Milk Pasteurizer.

used. The polarity is not reversed, that is, the electrode is made negative as in ordinary steel welding. The operator does not use either the weaving motion or the dipping motion but must acquire the knack of advancing as fast as possible along the seam in a perfectly straight line.

On all forms of production welding on sheet material it is necessary to use chill bars beneath the joint. These are usually made of strips of copper ¼-inch thick by 2-inches wide. When they are needed for circumferential seams, an iron spider is first formed, and covered with a copper band to provide the chill.

The welding operations in the Mojonnier plant are of unusual interest. They involve work on practically all of the commercial metals including aluminum and there is a considerable variety in the designs of the equipment and of joints. Facilities are available for using all of the welding processes so that there is opportunity to take advantage of the particular features of all of them at different times. Futhermore, the

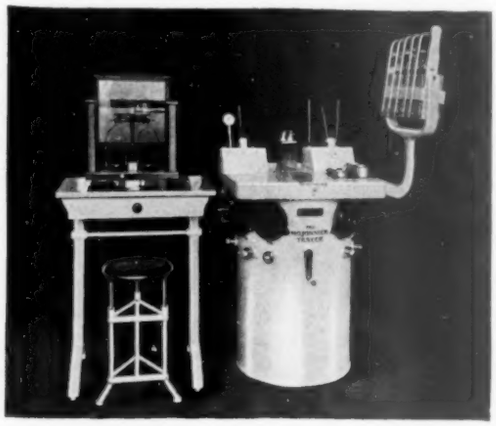


Fig. 13. Milk Tester.

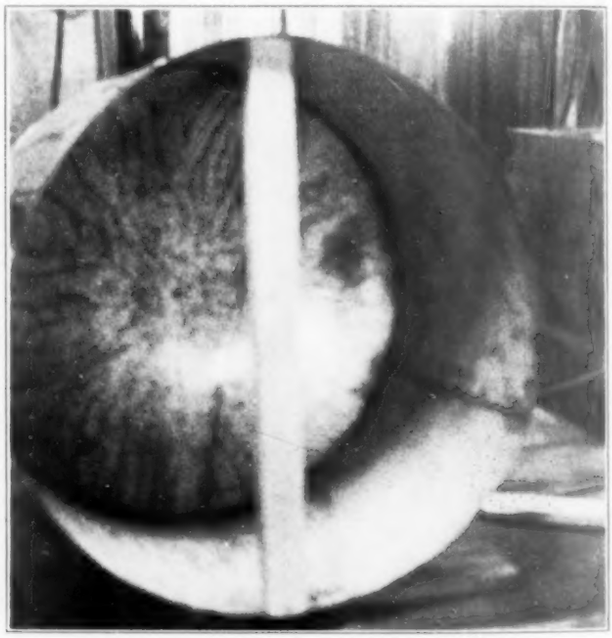


Fig. 14. Shell of Hot Well (Stainless Steel).

experience of these manufacturers has indicated that welding is an essential tool in the manufacture of milk machinery to meet the present day demands for efficiency and sanitation.

EUROPEAN ENGINEERS WILL WITNESS LINCOLN WELDING DEMONSTRATION

Mr. J. F. Lincoln, President of the Lincoln Electric Company, recently sailed on the Leviathan for London, England, where he will take charge of a demonstration for European engineers of the Electronic Tornado process of carbon arc welding. The demonstration will take place at The Allen Liversidge plant. The demonstration has been arranged in answer to numerous requests from engineers and manufacturers in all parts of Europe.

National Metal Week

City of Cleveland Welcomes Visitors Representing All Phases of Welding—Programs and Exhibits Have Large Interest for All

DUE to the splendid efforts of the American Society for Steel Treating, supported by the American Welding Society, the Institute of Metals Division of the A. I. M. E., the Iron and Steel Division of the A. S. M. E. and the Iron and Steel Division of the A. I. M. E., the annual National Metal Congress and Exposition has grown to be an event of major importance in the industrial world. For one week there is offered to plant executives, engineers and research men an opportunity to get together and concentrate upon all manner of problems involved in the production and fabricating of all kinds of metals into American products. At the same time, materials, processes and machinery of the most up-to-date design are assembled for inspection. So for five days the representatives of practically all of the important industrial corporations of the country concentrate their attention on the possibility of improving present day methods of fabricating metal articles or metal parts.

The National Metal Congress and Exposition is being held this year at Cleveland. This city is at the center of a 1,000 mile circle, containing over half the population of the entire country, and because of its geographic position has long been an important center of the iron and steel industry. It is reported that Cleveland smelters today have an annual capacity of 3,000,000 tons of pig iron. And within a few hours' drive of the city are such great steel producing centers as Pittsburgh, Chicago, Youngstown, Warren, Massillon and Canton. In addition a number of the non-ferrous metals are manufactured in large quantities within this same area. Naturally, this huge volume of available raw material attracted to the district served by Cleveland a large number of metal industries. It has, in fact, made Cleveland a world leader in the production of several important metal products. Last year in the city of Cleveland itself there were over 2,400 manufacturing companies who purchased raw material costing over $600,000,000.00 and fabricated them into products which sold for well over $1,000,000,000.00. It is estimated that the National Metal Congress and Exposition will draw an attendance of more than 60,000 visitors and the above facts will give some indication of the type and importance of the industries who will be represented by these visitors.

The continued rapid expansion of welding applications, backed by extensive research activities, has greatly increased the importance of the welding section of the Exposition and the welding portion of the technical meetings. Men who have heard reports or who have read articles concerning the use of various welding processes in the fabrication of products in which they are interested have an opportunity to see these processes actually demonstrated, and to listen to scientific reports on the efficiency of welding operations in manufacture and also in plant maintenance.

The part played by the American Welding Society in this great annual event is therefore an important one. Because of the mass of important material available, it has been necessary to increase the technical sessions to six this year and to allow some time for reports of important research projects. The morning sessions will be held at the Hotel Statler and the afternoon sessions will be held at the Cleveland Public Auditorium. No less than nine research papers will be presented, three of them dealing with newly discovered non-destructive tests of welds. One of these tests, based on electrical conductivity, is the discovery of Elmer Sperry, well known inventor and president of the American Society of Mechanical Engineers. The second involves the use of the stethoscope and third X-ray methods.

Other research papers cover "nitrogen needles," electric welding by the carbon and metallic arcs, special metallographic studies, stress-strain characteristics of welded joints and the use of X-rays in examining welds.

Two papers will deal with the welding of boiler tubes and drums, the tubes of mercury boilers, etc. Other subjects covered by technical papers include gas welding of steel buildings, automatic welding of thin sheets, welding of pipe lines, replacement of castings by welding in machine construction, and the welding of copper alloys and high-strength aluminum alloys.

In addition to the nine research papers three special sessions will be devoted largely to research. A meeting of the Bureau of Welding will deal with a variety of research projects. The meeting of the Structural Steel Welding Committee will record advances in that fast-developing field. A special conference of college professors and other research workers will be called to discuss welding research and further the co-ordination of activity along this line.

All in all this is considered to be the best program yet prepared for a meeting of the American Welding Society.

Those attending the A. W. S. Fall Meeting may profit also by the sessions of the American Society for Steel Treating, the Iron & Steel Division of the American Institute of Mining and Metallurgical Engineers, the Institute of Metals Division of the American Society of Mechanical Engineers, which are meeting simultaneously in Cleveland.

The complete program of the American Welding Society Fall Meeting follows:

MONDAY, SEPTEMBER 9, 1929

Morning

Registration—Registration facilities will be provided for members and guests at the Hotel Statler, commencing Monday, September 9, at 10:00 a. m., and at the Public Auditorium, commencing Monday at 12:00 M.

Afternoon

Meeting of Board of Directors, American Welding Society, 2:00 p. m., Hotel Statler.

TUESDAY, SEPTEMBER 10, 1929

Morning

Business Session

10:00 a. m., Hotel Statler, F. T. Llewellyn, President, Presiding.

This will be in the nature of a few introductory remarks by President Llewellyn and transaction of any formal business or introduction of local celebrities.

Technical Session

10:30 a. m., Hotel Statler, A. E. Gaynor, Vice President, Presiding.

The Effect on Design of the Use of Welding in the Manufacture of Electric Machinery, by H. G. Reist, General Electric Company.

Cutting and Welding Steel Parts to Replace Castings, by W. F. Buchanan, The Bessemer Gas Engine Company.

Afternoon

Technical Session

2:00 p. m., Public Auditorium, H. L. Whittemore, Bureau of Standards, Presiding.

Welding of Copper and Copper Alloys, by I. T. Hook, Research Laboratory, American Brass Company.

Welded High Strength Aluminum Alloys for the Aircraft Industry, by J. R. Dawson, Research Laboratory, Union Carbide & Carbon Research Laboratory.

How to Test Welds, by F. G. Tatnall, Southwark Foundry and Machine Co.

Evening

9:30 p. m., Cleveland Hotel, Metal Congress Dance.

WEDNESDAY, SEPTEMBER 11, 1929

Morning

8:30 a. m., Starting from Hotel Statler, Inspection Tour of three plants.

10:00 a. m., Hotel Statler, Conference of research workers on Fundamentals of Welding, H. M. Hobart, Chairman, Presiding.

Afternoon

Technical Session

2:00 p. m., Public Auditorium, J. J. Crowe, Air Reduction Sales Co., Presiding.

Study of Nitride Needles, by P. Alexander, General Electric Company.

Carbon Arc Welding, by G. E. Doan and E. E. Kholm, Lehigh University.

A Metallographic Study of Some Metal Arc Welds, by H. M. Boylston, Case School of Applied Science.

Metallographic Studies of Welding and Cutting, by M. Yatsevitch, Watertown Arsenal.

Evening

7:30 p. m., Hotel Statler, J. N. Edwards, Chairman, Presiding.

Meeting of Structural Steel Welding Committee.

THURSDAY, SEPTEMBER 12, 1929

Morning

Technical Session

9:30 a. m., Hotel Statler, F. T. Llewellyn, President, Presiding.

Motion picture on "Gas Welded Steel Building."

Gas Welding of Steel Building, by H. M. Priest, American Bridge Co.

Stress Strain Characteristic of Welded Joints, by J. H. Smith, University of Pittsburgh.

Stethoscopic Study of Welds, by A. B. Kinzel, Linde Air Products Co.

Welding Studies at the Watertown Arsenal, by Major J. B. Rose, Ordinance Dept., U. S. A.

Afternoon

Joint Technical Session with A. S. M. E.

2:00 p. m., Public Auditorium, F. M. Farmer, Presiding.

Non-destructive Tests of Welds, by Elmer A. Sperry, Sperry Development Co.

Foreign Practice in Welding of Boiler Tubes and Drums, by G. A. Orrok, Consulting Engineer.

Automatic Arc Welding of Thin Sheets, by W. L. Warner, General Electric Company.

Evening

Annual Banquet and Dance

6:30 p. m., Hotel Statler, Annual Banquet and Dance.

FRIDAY, SEPTEMBER 13, 1929

Morning

10:00 a. m., Hotel Statler, J. C. Lincoln, Lincoln Electric Co., Presiding.

Oxy-acetylene Welding of Pipe Lines in the Field, by W. R. Ost, Air Reduction Sales Company.

Welding of Pipe Lines, by H. C. Price, Welding Engineering Company

Welding of Tubing and Pipes for Locomotives and Boilers, by H. A. Woofter, Swift Electric Welder Company.

Afternoon

American Bureau of Welding

2:00 p. m., Hotel Statler, Prof. C. A. Adams, Director, Presiding.

Meeting of American Bureau of Welding.

At the great Exposition in the Cleveland Public Auditorium more than 275 manufacturers will be represented in the exhibits covering over 80,000 square feet of floor space. A special section of the Auditorium has been set aside for welding exhibitors. Here will be found a representative group of displays of the very latest developments in apparatus and materials for welding. A preliminary survey of the available information regarding the exhibits shows promise of many interesting features. For example, a method of testing welding glass to show its protective value by means of a galvonometer and a thermo-couple will be shown in actual operation; there will be several working demonstrations of various types of automatic arc welding equipment some of which are being shown for the first time. There will be actual demonstrations of some of the special arc welding processes which have attracted so much attention in recent years. Different materials for hard facing will be shown and demonstrated with information available as to the applications of this interesting process in industrial plants. Pipe welding operations will receive considerable attention, the demonstrations ranging from the automatic arc welding of pipe to the fabrication of useful articles from commercial sizes of pipe. There will be several new types of testing equipment demonstrated which have recently been developed and which are of great importance in connection with the use of welding in the erection of steel structures and in the fabrication of pressure vessels. All of the resistance welding processes will be demonstrated, the exhibits including a number of machines which have not been previously announced. There have been several important developments in the design of oxy-acetylene welding and cutting apparatus, including new types of torches and regulators, and new types of mechanically operated cutting torches. These will form an important part of the exhibition. There will also be complete exhibits of safety clothing and safety devices of all kinds for use in connection with welding operations. A complete automobile chassis will be set up in one booth, so arranged as to show the location of over 1,300 welds. X-ray and negatives and photographs of castings showing internal flaws detected by the use of X-rays will be exhibited. There will be a large variety of non-ferrous metals for welding and non-ferrous welding rods, including bronze and other special copper alloys on display.

The inspection trips noted on the program include visits to some of the most interesting types of manufacturing plants in America. An inspection trip arranged by the American Welding Society for the morning of September 11th includes a visit to an oxygen plant where the party will see commercial oxygen prepared and stored in cylinders, the production being shown by both the electrolytic method and the air liquefaction method. Some special steel cutting operations will be demonstrated at a large warehouse. The third feature of the inspection trip is a visit to a plant where electric welding apparatus and electric motors are manufactured and in which can be seen a great deal of the utility of the application of arc welding to manufacturing programs.

Altogether the National Metal Congress and Exposition offers an opportunity to bring one's knowledge of all of the welding processes thoroughly up-to-date and to become posted on how metal working plants are using these processes to improve their products and to lower their production costs.

Atomic Hydrogen and Heavy Materials

Process Being Applied on Plate up to One Inch Thick—Corner Weld Proves Useful Design—Building-up Operations Successful

By J. T. Catlett*

THE fabrication by arc welding incident to manufacture is gradually being extended to include sections which were formerly considered as being entirely out of the field of welding. The Atomic-Hydrogen process most usually considered in the welding of thin materials, is being successfully applied to fabrications involving plate thicknesses as great as one inch. One of the interesting features of the Metal Trades Exposition held in Cleveland is a Portable Atomic-Hydrogen Welder manufactured by the General Electric Company. This equipment, illustrated in Fig. 4, is designed to furnish current values from 15 to 70 amperes for the welding of materials up to ½ in. thick, although other models, using more current, are designed to weld heavier stock.

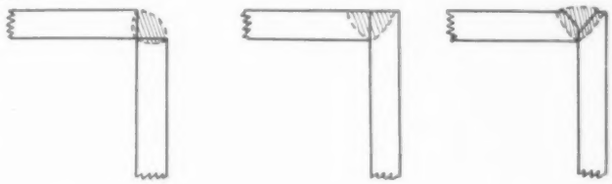


Fig. 1 Fig. 2 Fig. 3

Figs. 1 to 3—Variations of the corner weld used with the atomic hydrogen process. Solid lines show original material.

Being comparatively new, this process may not be familiar to all and will require a word of explanation. The heat energy required for welding is furnished by an electric arc maintained in a stream of hydrogen. Tungsten electrodes are used and while slowly evaporated by the intense heat, perform no other function than to establish the path of the arc. The hydrogen absorbs the heat of the arc and in so doing is converted from the molecular to the atomic state. This stream of atomic hydrogen is applied to the material to be welded. A short distance beyond the arc the atomic hydrogen returns to the molecular state and releases the heat previously absorbed. The weld is surrounded by hydrogen in a very active state which prevents the formation of oxides. Additional material in the form of filler rod may be added when necessary. Characteristics of welds made by this process are of uniform strength, ductility, lack of porosity and a clean, smooth finish.

The corner weld, illustrated in Figs. 1, 2 and 3, is very useful in this form of fabrication. This type of joint is used where the desired radius is too short for bending the plate material used. Where strength equivalent to that of the plate is required, Fig. 1 is more desirable as a slightly higher speed can be obtained even with the addition of filler rod. Penetration can be accurately controlled so that perfect fusion of the plates is obtained. If a sharp corner is desired with a minimum of grinding Fig. 2 is very satisfactory. With heavy plate this becomes essentially a butt weld and for thicknesses in excess of ¼ in. usually requires some bevelling to insure perfect penetration. This is most easily accomplished by chipping as shown in Fig. 3. This is particularly useful where a flange of heavier material for bolting to another piece of apparatus is to be welded to a container. The finished appearance is such that grinding is unnecessary in the majority of applications.

The fluid condition of the metal while being welded and the lack of porosity obtained make the Atomic-Hydrogen process very desirable where water-tight or oil-tight joints are necessary. Rejections due to leaks are rare, but when they occur can be remedied very easily. Metal in practically any desired quantity can be added and the finish shows no evidence of the repair. Examples are to be found in oil tanks, switchgear cases and vacuum tanks.

Fabricated aluminum switch gear cases show a considerable saving in weight and cost over the previously cast cases. Rejected material due to blow holes and porosity is entirely eliminated. The largest of these cases are fabricated from ¼ in. sheet aluminum with flanges of ⅜ in. and ½ in. aluminum. Filler rod is always used in welding this metal and this results in excess material which must be removed at certain points. Other than this the machining operations are reduced to drilling.

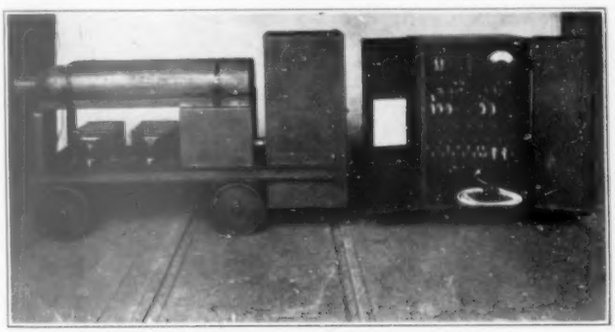


Fig. 4—A portable atomic hydrogen welder.

Fig. 5—Vacuum chamber for rectifier welded by the atomic hydrogen process. The joints must be exceptionally tight to maintain the exceeding high vacuum required for this apparatus. The chamber is 5 ft. 10 in. in diameter, 3 ft. 2¼ in. high and ½ in. stock. Larger tanks are made of ¾ in. stock.

Large steel castings which would be rejected because of blow holes and other flaws are being salvaged by this process. The flaw is chipped out until clean metal is obtained and metal of the same analysis added. Metal can be added at the rate of six to eight cubic inches per hour. The ap-

*Welding Engineering Department, General Electric Co., Schenectady, N. Y.

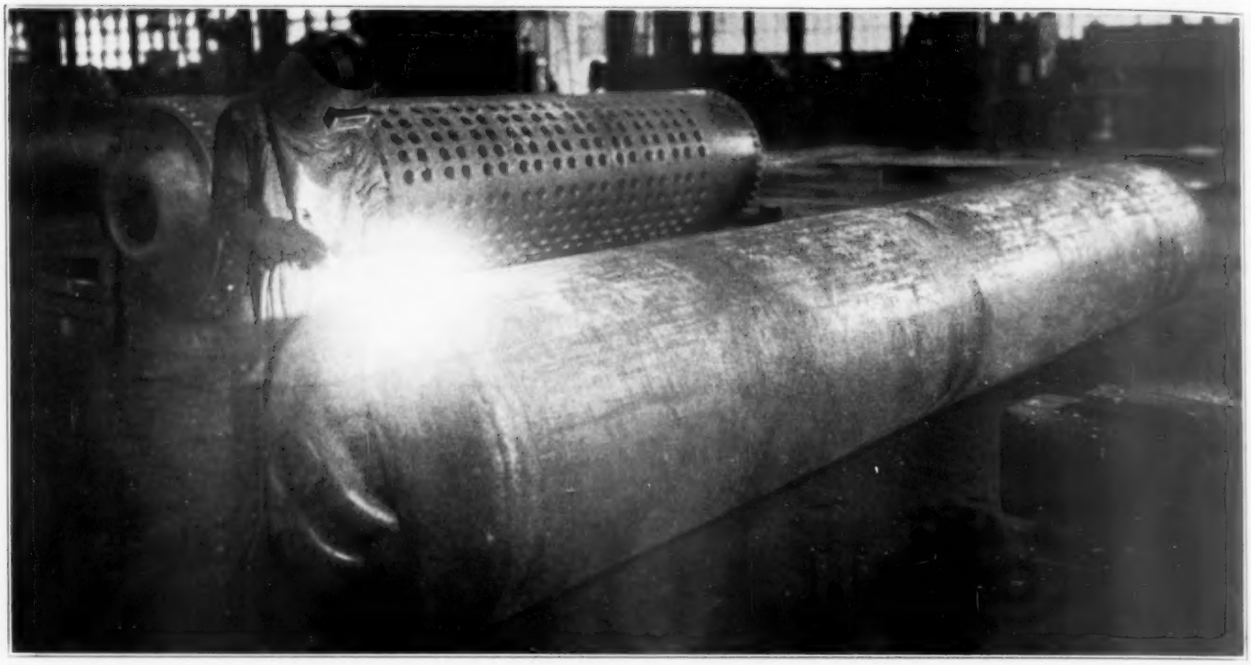


Fig. 6—A high pressure boiler, 22 ft. long, 3½ ft. in diameter and of ½ in. stock. Longitudinal and end seams are welded.

pearance of the weld when completed is similar to that of the casting and in most cases is not objectionable. A rough grind is sufficient to remove evidence of a repair. If it is desired to have the deposited metal of the same analysis as the casting, filler rod slightly higher in carbon than the parent metal should be used. The strength of the deposited material is practically the same as that of the casting.

Metal has been added to large forged steel shafts where inaccuracies in forging or in machining operations have resulted in an undersized product. Subsequent machining removed all traces of the weld which could be detected by visual inspection. An example is furnished by a steel shaft 14 inches in diameter and approximately 10 feet long on which the location of the oil groves had to be changed after all operations were completed. A day and a half of a welder's time made it possible to use this shaft without any evidence of a repair having been made. Repairs of a similar nature can be made on similar pieces, and where the labor is a large part of the total cost, a considerable saving is effected.

As a general welding tool, the process is well adapted to building up worn or broken moulds and dies. Deposited metal can be accurately placed with just enough excess to permit the necessary machining operation. Punching dies for sheet steel repaired in this manner give service equivalent to that of a new die in number of punchings per grind.

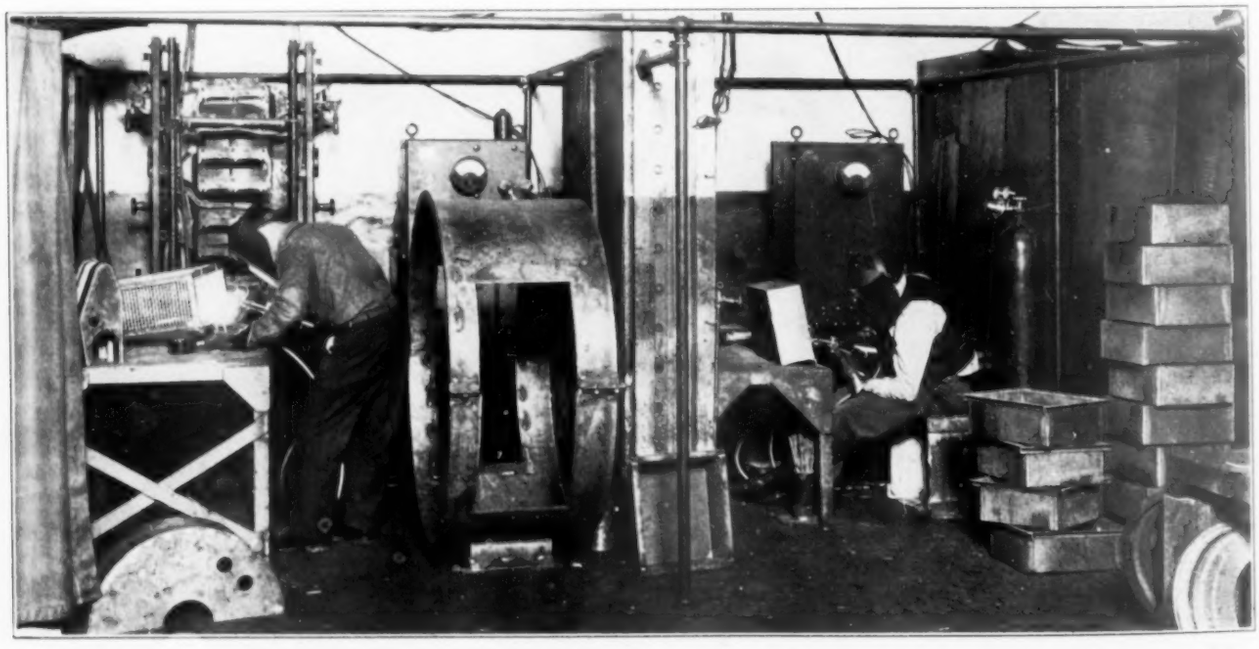


Fig. 7—Installation of atomic hydrogen welding apparatus showing booths with curtains drawn aside and typical light gauge products.

Welded Piping in Chicago Skyscraper

Up-to-Date Installation of Steam, Fire and Sprinkler Lines Is a Feature of New 40-Story Carbide and Carbon Building

THERE are probably few districts in the country where it is possible to find a greater volume and a greater variety of welded piping than can be found in the Chicago district. It includes oil and gas pipe lines, refrigeration installations, oil refinery work, power plant piping and other types of industrial piping. Yet there is one great field for the use of pipe welding which up until recently has been

Many Turns in a Small Space.

completely neglected, that is, in the pipe installations of Chicago's many down-town skyscrapers. In these huge modern buildings, oxy-acetylene welding is often used to good advantage for the purpose of making repairs in existing pipe lines, but for some reason no advantage has ever been taken of the process for initial installations of any size until the time came for the construction of the new Carbide and Carbon Building on Michigan Avenue which was finished this year.

This is a forty story structure in which no pains have been spared to give the tenants the benefit of very mod-

Welded Flanges Here.

ern accomplishment in utility and beauty in a building of this character. Its location on upper Michigan Avenue and its imposing and artistic appearance make it a very interesting land mark. The builders have paid great attention to securing for their tenants the very best of high grade accommodations and service.

It was as a part of the general plan to use every mod-

Drawing of the New Union Carbide and Carbon Bldg., Chicago.

ern construction feature that it was decided to use welding for the installation of the heating system. This is the first Chicago office building to have a completely welded heating system; and in addition to this the mains of the fire lines and the automatic sprinkler system are welded. The engineers and other executives interested in the construction were concerned not so much with the lowered installation costs as with the matter of securing pipe systems which were so constructed that maintenance cost promises to be held at an absolute minimum. In a large office building it is of course important that the steam piping should work at high efficiency because so much is dependent upon the comfort of the tenants and their customers. However from a safety standpoint it is also desirable to secure the best possible installation for the fire lines and the main lines of the

automatic sprinkler system because these systems represent protection of the lives and property of the occupants.

The welded piping in the heating system starts at the boiler room and goes through the entire system. The main steam header with eight branches varying in diameter from 2 in. to 10 in. was entirely constructed by welding, no flanges or special fittings being used. In the boiler room and near it there is also a considerable amount of auxiliary piping in connection with various types of mechanical equipment all of which was put together with the torch. It is in this class of work that welding appears to a great advantage because the location and the complicated nature of many of the connections would call for numerous expensive fittings. A good many of these would have to be made to order and in addition to the extra expense of installing such fittings there is the disadvantage of leaving a number of possibilities for leaky joints and gasket troubles. In the welded assembly there are no parts to work loose and cause trouble of this sort. Now that the steam pipes in the boiler room have been covered with insulating material the absence of bare flanges or large bulges in the insulation at special fittings, is evidence of the advantage of the welded system in this respect. The engineer who looks over the installation will be impressed by the ease of application of the insulation of material and also at the tremendous saving in weight through the elimination of a great many of the fittings customarily used with older methods of installation.

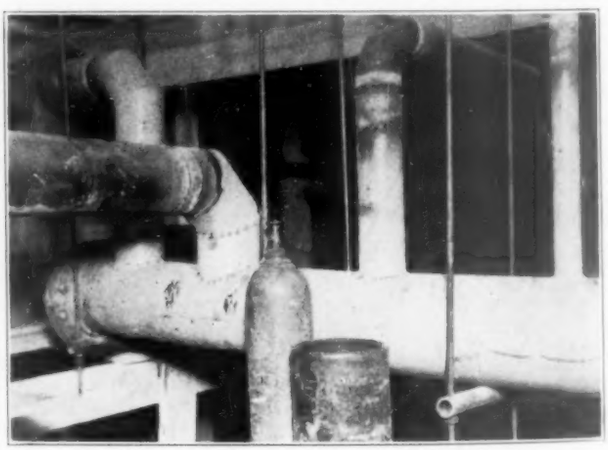
Tees, Reducers and Bends, All Welded.

Bends Made From Straight Pipe.

From the boiler room, two floors below the street, an 8 in. and 10 in. line turn upward into the pipe shaft and form continuous unbroken risers, each individual length of pipe made an integral part of the system by welding. To the thirteenth floor, where expansion joints are inserted, each riser has, to the uninitiated, the appearance of a jointless steel tube and in effect is just such a unit. Above the expansion joints the pipes make a swing to avoid structural members and then continue as uninterrupted columns to the twenty-third floor. Here the 10 in. riser bends, twists, and rises to an attic space where it branches and circles the building with tak-offs at various locations, supplying the down feed risers to which the short radiator supply lines are connected. The attic above the twenty-third floor is virtually a distributing point for all steam, the lower floors being heated by the steam mains supplied by the 10 in. main which rises untapped to this level, while the tower stories are heated by the steam mains supplied by the 8 in. riser with take-offs at each floor above the twenty-third.

Welded Lines Require Small Space for Installation Work.

In the cramped attic space welding appeared to special advantage. Here turns, branches, reducers, tees, in fact all special fittings, have been formed into an integral part of the whole unit, built in exactly where desired by the use of oxy-acetylene cutting and welding. Large pipe cutting and threading machines, heavy cumbersome wrenches and



Note Saving of Cost and Weight in This Header.

pipe tongs, and expensive scaffolding or staging were unnecessary for any of this work, even the regulating valves being furnished by the manufacturer with specially prepared ends ready to be welded into the line.

The completed welded unit looks as though it had grown into the building instead of having been assembled piece by piece and when steam pressure was turned on for test not a leak appeared in the welding piping, although as would be expected, a few fittings split in the unwelded portions. The steam fitter foreman was much impressed by this and by the fact that it was possible to draw an unusually high vacuum on the system under operating conditions.

For fire protection a completely welded high pressure system makes water available from the pumps in the basement to the farthest corners of every floor in the structure, through one high level and two low level standpipes. In addition to these standpipes the mains and risers for the automatic sprinkler system in the basement and sub-basement are included in the fire protection equipment and are welded throughout.

No Changes of Direction Are Too Complicated for This System.

Joints in the brass hot water piping were also welded, using recently developed high silicon strength bronze welding rods. The economies possible in welding brass piping are evident when the high cost of brass fittings are considered.

A study of the accompanying photographs of portions of this interesting installation will show that in some cases changes in direction were accomplished by cutting and welding standard pipe to make the necessary bends and in other cases these bends were accomplished by welding in Tube-Turns. These Tube-Turns are made by drawing pipe over a mandrel in such a way as to produce a perfect circular shape with uniform wall thickness and uniform cross-section. These Tube-Turns can be cut so as to produce any desired angle of bend and they are readily welded into the line, using the conventional butt weld design.

It has been proven to the satisfaction of competent engineers that the life of a properly made welded joint is at least equal to that of the pipe of which it forms an integral part. With the welded joint there is no reduction of pipe wall thickness inherent with thread cutting and no dependence is placed on gaskets of material different from the pipe itself. Valuable space is saved by welding in locations where ordinary pipe fiting methods would require considerable room for purposes of accessibility, both for installation and repairs, which latter must be kept in mind where non-welded construction is used. If for any reason alterations to a welded line are desirable they can be easily made with the cutting and welding torch in very limited space so that even for this contingency only the very minimum of space is required.

CLEVELAND WELDING SCHOOL GAINS POPULARITY

One of the best known schools in the country for instruction in gas and electric welding is The Cleveland Welding School, Cleveland, Ohio. Several years ago the Cleveland Y. M. C. A. conducted a school for welders along with their other vocational work and its course of instruction was very well and favorably known. Instructors in that school were R. K. Randall and Edward T. Scott. When the

HOME OF
CLEVELAND
WELDING SCHOOL
THE FOLLOWING MANUFACTURERS PRODUCTS ARE USED IN THIS SCHOOL TO TRAIN WELDERS
WILLIAMS COMPANY
WELDING WIRE AND SUPPLIES
THE BASTIAN-BLESSING COMPANY
MANUFACTURERS OF REGO WELDING AND CUTTING EQUIPMENT
WELDING ENCYCLOPEDIA
A COMPLETE AND AUTHORITIVE REFERENCE BOOK ON ALL KINDS OF FUSION WELDING
THE HARRIS CALORIFIC COMPANY
GAS WELDING AND GAS CUTTING APPARATUS
THE LINCOLN ELECTRIC COMPANY
CLEVELAND OHIO
LINC-WELD MOTORS STABLE-ARC WELDERS
CHICAGO STEEL & WIRE CO.
WELDITE WELDING ROD
FUZON ARC WELDERS

The Message of Welding in Outdoor Advertising.

Y. M. C. A. saw fit to discontinue this part of its educational work Randall and Scott decided that the demand for this instruction was so stable that it would be a good thing to continue their activities in training welders in that city. Consequently they opened what is now known as The Cleve-

Attractive Entrance to the Cleveland School.

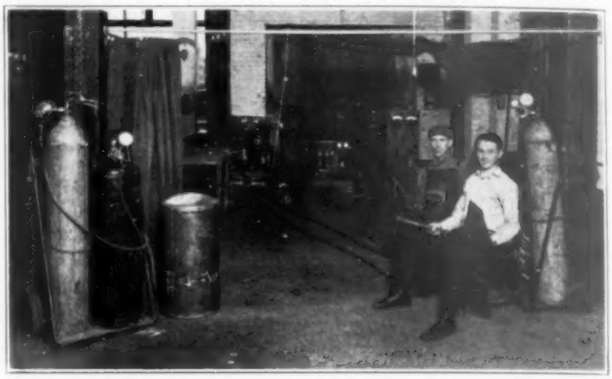
land Welding School and established it in rather small quarters on East 19th Street. The facilities there, however, were entirely inadequate to the amount of work they were able to handle, so on the expiration of their lease they moved to a building at 2261 E. 14th Street, taking a long-time lease on quarters which provide 5500 square feet of working floor space.

In this new location The Cleveland Welding School has twenty oxygen-acetylene units and three standard arc-welding machines. They have already organized courses of both day and night instruction covering each process separately or a combination if this is desired. They have trained men from all over the United States and Mexico and Mr. Randall says that they have even had inquiries from foreign

governments regarding the possibilities of giving training to selected students.

The objective of the training given in The Cleveland Welding School is to really give students the personal ability to hold down a welding job and these conscientious and enterprising young men have found it not at all difficult to place men in good paying positions upon the completion of their courses. One of the most interesting features of this school is the industrial rehabilitation work conducted in cooperation with Edward I. Benson of the State Association for the Crippled and Disabled. Men who have lost limbs or hands and would ordinarily be termed unfit for future use in industry have been fitted with special devices which enable them to control the filler rod, the torch or the electrode handle and have been taught to weld. Many of these men have been returned to industry as efficient welders and have no difficulty in making themselves valuable to the firms by whom they are employed.

The four photographs accompanying this article give a very good idea of the school. In one of them is shown what is considered to be the first outdoor wall sign advertising welding products. This sign is illuminated until 11 o'clock each evening and carries its message to thousands of home-going theatre-goers in Cleveland. It is also interesting to note that all of these products listed on the sign are well advertised products. Another photograph shows the main entrance to the school. This picture indicates that in addition to school work Randall and Scott offer a general welding service to firms who need it. There is also shown a view of the set-up of the electric welding machines used in the school. It will be seen that canvas screens are used to divide the space into units so that the men are well protected from all radiation. The fourth picture is a general view of the Oxy-acetylene welding instruction department. The gas is manifolded for delivery to twenty torches. The oxygen installation is made of brass, a flexible copper tubing being used to connect the heat regulator to the line. This equipment was furnished by the Harris Calorific Company of Cleveland. Other types of oxy-acetylene equipment used in the school are Airco-B. B., Burdett-Imperial, Oxweld, Purox and Rego.



The Arc Welding Department.

With the possibilities available in this locality Randall and Scott are able to give courses of either a general or special nature, depending on the requirements of the students. It is their policy to make conscientious investigation of the capabilities of all applicants and to encourage only those who show promise of getting good results from the money and effort put into the training. The school has a splendid reputation locally because graduates are known to have been given thorough instructions in the fundamentals of welding. Considerable credit is due to the proprietors for their willingness to undertake the responsibility of carrying on the instruction work in this locality where a good supply of well trained welders is of so much importance.

The Gas Welding Tables. Several Types of Equipment Are Installed.

Trends in Automatic Arc Welding

Improvements in Equipment Increase the Range of Applications and Thus Make Possible a Greater Amount of Production Welding

By W. W. Reddie*

PROGRESS in the development of equipment and methods in any industrial process invariably leads to a broader field of application for the process. In fact, the need for the process is often the cause of advances in equipment design.

This has been the course with automatic arc welding. The evident economy of automatic welding on many industrial operations has been responsible for continuous improvements in apparatus which broaden the scope of application of automatic arc welding. These improvements have taken the form of more compact dimensions, increased sensitivity and more accurate means of control. Reduction in dimensions affords more flexibility of mounting, which results in more practical and less expensive construction in work handling tools.

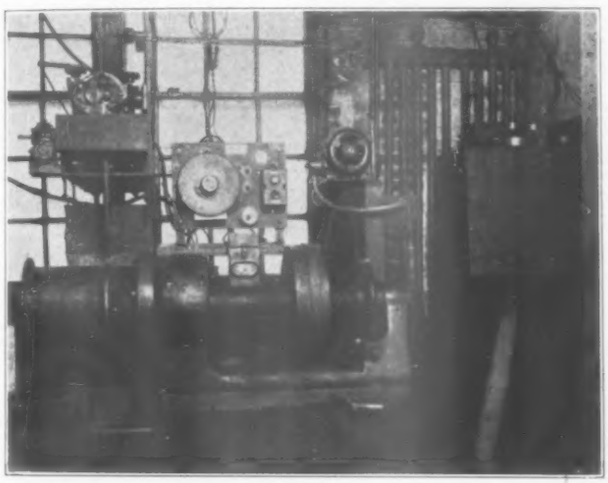


Fig. 1—Automatic Welding Applied in the Manufacture of Nickel Coated Pots.

Increased sensitivity and more accurate means of control are factors in the automatic welder itself, which tend to permit higher welding speeds. In conjunction with these requirements, the ease of adjustment and permanence of adjustment, are very desirable as these factors make it easier to train machine operators and contribute to securing uniform products and consistent operation of machine.

One of the fundamental reasons for the rapid growth of electric arc welding is that welding permits manufacturers to improve a product or produce a new product, which without welding would be either impossible of production or if produced would have a prohibitive cost. Thus it is that welding has had marked economic effects on metal working processes and products.

This trend in automatic welding machinery designs and products is illustrated by equipment and welded products on display at the Westinghouse Electric & Manufacturing Company's exhibit at the National Metal Exposition.

The Weldomatic, the Westinghouse Company's most recent contribution to automatic welding, is shown in operation on a pipe handling tool, suggestive of automatic field welding of pipe lines. It is quite possible that further tool developments will place the field welding of pipe lines within the scope of automatic welding. Results obtained thus far on hand welding of pipe lines indicate that this is a most desirable development. The compact dimensions, ease and permanence of adjustment of this machine are thought to be features of this equipment which will contribute to an early solution of automatic welding of pipe lines.

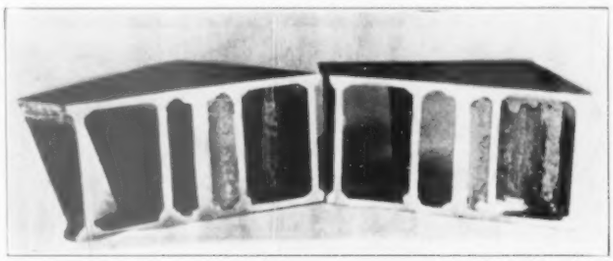


Fig. 2—Bridge Pedestal Automatically Welded by Leake & Nelson Company, Bridgeport, Connecticut. Illustration Shows the Pedestal Cut in Half. Perfect Penetration, no Overlap and no Weld Flaws Were Evidenced by This Examination.

Nickel coated pots, in which a base shape of steel is coated with an non-oxidizing layer of metal by means of automatic arc deposition, are said to constitute a distinct advance in the processes of manufacturing pots for heat treating. Figure 1 illustrates the automatic welding equipment at work on these pots.

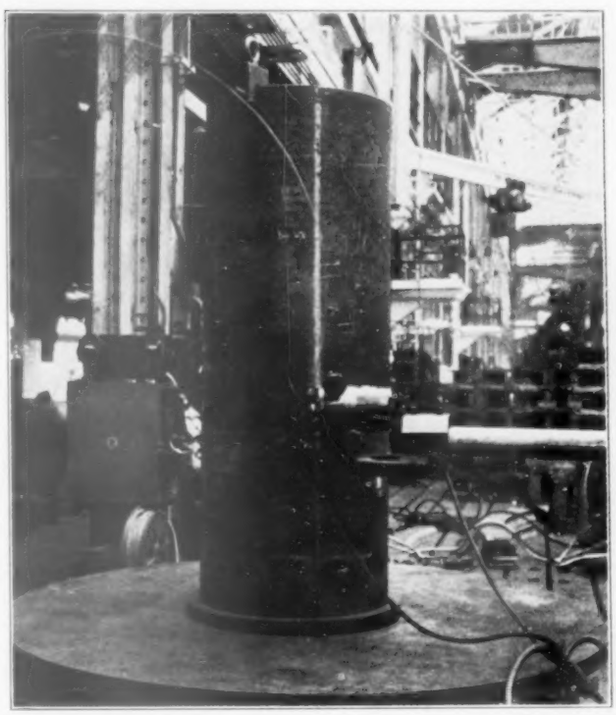


Fig. 3—Automatic Welding of Large Tanks.

Similarly, automatic welding has been responsible for marked improvements in the manufacture of various types

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**Arc Welding Sales Manager, Westinghouse Electric & Mfg. Co.*

of pipe. The welded spiral pipe manufactured by the Naylor Spiral Pipe Company of Chicago, well illustrates another product in which automatic arc welding has played its part in reducing a new and improved product. Samples of this pipe are on display at the Westinghouse Company's exhibit.

The samples of welded pipe exhibited by the Spang Chalfant Company represent still another phase of pipe welding, wherein automatic welding has been most advantageously used. These samples illustrate production methods of joining standard lengths of pipe for making long lengths.

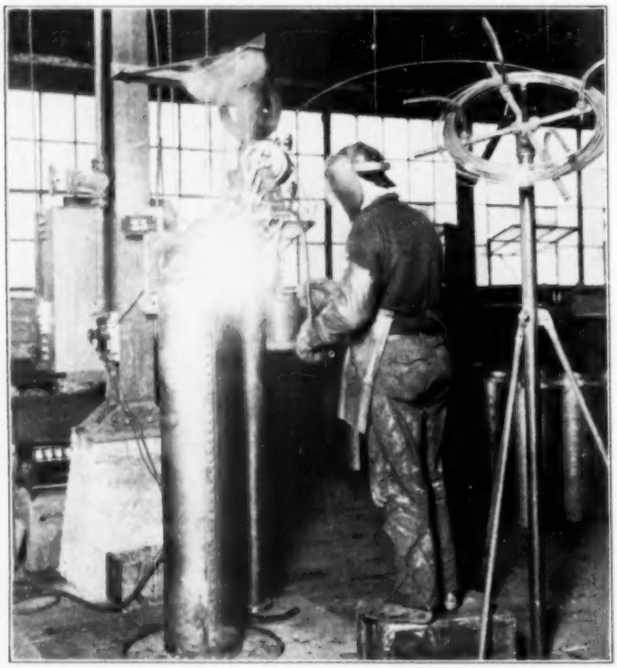

Fig. 4—Application of Automatic Welding in the Manufacture of Small Tanks by Wm. B. Scaife & Sons Company, Oakmont, Pa.

The advances made by arc welding in structural steel work during recent months have caused fabricators and erectors to begin to look to automatic arc welding as their next step. With automatic equipment available that affords adaptability and flexibility of application and ease and permanence of adjustment, there is no reason why it cannot readily be applied to many structural steel operations. Some fabricators have already begun to look into the applications of automatic welding for their products. Among these are the Leake & Nelson Company of Bridgeport, Connecticut, who have already adapted automatic welding to the manufacture of Bridge pedestals. (See Fig. 2.)

The advances in the applications of automatic welding during the past few years in the manufacture of automobile parts, pipes, tanks, etc., and in reclamation work involved in building up worn parts, have been almost phenomenal, but with the new equipment now available, it is predicted that increased economy may be experienced on existing applications and that the present field of application for automatic welding will be materially broadened.

DATE SET FOR I. A. A. CONVENTION

Announcement has been made that the annual convention of the International Acetylene Association will be held at the Congress Hotel, Chicago, November 13, 14 and 15. This annual meeting is an outstanding event in the oxy-acetylene field each year and the programs from year to year have furnished some exceedingly valuable and significant contributions to the literature of welding. It will be remembered that at last year's convention there was presented a report of the Oxy-Acetylene Committee of such length that it was necessary to print it for distribution. This report has been very much in demand because of the comprehensive picture it presents of the uses of oxy-acetylene welding in all of the major industries of the country. Since that time the same committee has been working constantly to amplify some portions of last year's report and to assemble new material on subjects which were not covered last year. In addition to this, there have been a number of interesting developments in the field of oxy-acetylene welding and cutting, all of which will be covered in interesting detail by technical papers which are in course of preparation and will be presented at the meeting.

SALES MEETING OF FUSION WELDING CORPORATION BRANCH MANAGERS

During the week of August 26th there was held at the main office and factory of the Fusion Welding Corporation, manufacturers of "Fuzon" welding equipment and "Weldite" welding rods, and a subsidiary of the Chicago Steel & Wire Company, a general meeting of the branch managers from all parts of the country. The meeting gave the branch managers an opportunity to become acquainted with the new quarters of the Fusion Welding Corporation, which has just finished the construction of a large addition to provide for a considerable increase in office and manufacturing space. They also had an opportunity to make a careful inspection of the Research Department and got first-hand information on some of the more recent developments of the company's products. An extensive sales program is planned for the coming year, starting with a demonstration of new products and new processes at the National Metal Exposition in Cleveland. The accompanying photograph was taken of the group assembled preparatory to the first session of the sales conference which was held on August 27th. The representatives in this group are: Top row standing from left to right: C. W. Reid, Kansas City; M. P. Hare, Tulsa, Okla.; E. J. Shuler, Chicago. Middle row standing left to right: J. E. Wolcott, Cleveland, Ohio; F. O. Weber, Pittsburgh, Pa.; A. Bernard, Chicago; R. F. Beazell, Chicago; R. O. Waldman, Los Angeles; H. L. Davis, Chicago. Bottom row seated left to right: J. P. Morrissey, Philadelphia; F. A. Green, New York City; L. F. Collins, General Sales Manager, Chicago; A. W. Courtney, San Francisco; B. Carpenter, Chicago.

Fusion Welding Corporation Branch Managers.

Economy Factors in Field Welding*

Costs May Be Reduced by Lowering Ratio of Helpers to Welders, Using Acetylene Generators, UsingCorrect Pressures, Using High Tensile Strength Rods

By W. R. Ost†

Tack Welder and Helper Tacking Joints for Firing Line Gang.

THIS is a big subject, involving many controversial points, and time will not permit covering the whole subject. I propose therefore to discuss the factors controlling the economical gas welding of pipe lines to obtain a highly satisfactory line, because, after all, our ultimate goal is to satisfy our client by giving him a pipe line that is absolutely free from leakage and interruption in service.

A hypothetical example of such a pipe line would be a continuous pipe able to resist all common forms of corrosion and to withstand all forces exerted upon it. We will assume that the pipe is able to resist corrosion. Of course, we know it cannot; but the use of protective coatings has gone a long way towards making it nearly non-corrosive. The fabrication of the line into one continuous pipe has been accomplished by welding. In the welding of this line by the oxyacetylene process we have also been able to aid in resisting the forces exerted upon the line.

Section of Welded Pipe Line With Trenching Machine in Background Moving at the Rate of 6 Feet Per Minute Through 12 in. of Dry Sand.

Engineers have recognized many of the forces exerted upon a pipe line, and as time goes on they will undoubtedly find more. Some of these forces are the internal force exerted on the pipe by the gas or liquid being transported, the force of expansion and contraction due to change in temperature, the shock force of heavy vehicles passing over it, the force of water flowing against it in rivers, and the forces of torsion and bending produced at sharp turns in the line. All these forces must be considered by the designing engineer when determining the diameter and wall thickness of the pipe needed to transport a given volume at a given pressure in a given time.

If the pipe is able to withstand these forces the problem of welding is simply a matter of making the joint or weld as strong as or stronger than the pipe. How can this be done economically? By economically is meant producing the best welds at the lowest possible cost. In the following discussion I will enumerate what has actually been done in the field in this direction.

The welding operations on any pipe line consist of tacking the lengths together, making the firing line or turning welds, making bell-hole or position welds, and fabricating fittings. The cost of any weld is made up of labor, material and overhead: labor charges are distributed among welders, helpers, laborers and foreman; material charges consist of oxygen, acetylene, welding rods; overhead charges include repairs to apparatus, depreciation on equipment, interest charges and a profit. The reduction of these charges has been carried out in the following ways.

Labor cost can be reduced by lowering the ratio of helpers to welders and by organizing the men into gangs. The tacking gang lines up pipe and tacks the lengths into sections to be welded by the firing line gang. The use of two welders for tacking is most desirable as it affords a lower ratio of helpers and laborers per welder. The number of laborers in a tacking gang is dependent on the weight of pipe; enough men are required to lift the pipe into position and block it. One helper can serve two welders, that is, move apparatus, change cylinders, supply rods, etc. Two welders working opposite each other can tack up a joint in one-half the time needed by one welder with the same number of laborers and helpers. Thus, joints can be tacked up at a lower cost per joint, due to the lower ratio of helpers and laborers per welder.

After the pipe is tacked it is ready for the firing line gang.

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*From a paper to be read at the Fall meeting of the American Welding Society, Cleveland, Sept. 9, 1929.

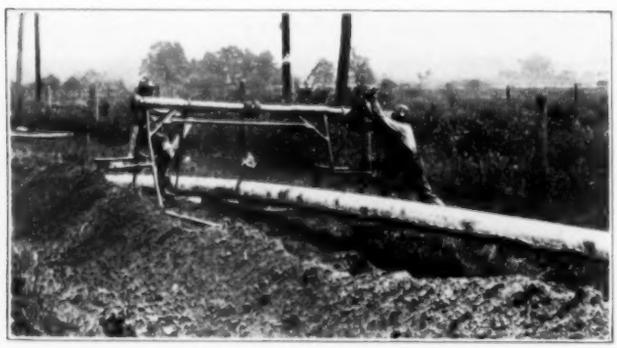
†Applied Engineering Department, Air Reduction Sales Co., New York.

The pipe lengths as received are tacked together into sections of four to ten lengths, depending upon the size of pipe, the length of section that can be conveniently handled, and the contour of the terrain.

Five lengths of pipe is a common size of section. One helper turns the pipe while as many welders as are needed weld all the joints in the section simultaneously. Most economical operation of the firing line gang depends upon a low ratio of helpers to welders. This ratio of helpers to welders must vary from one to three (1-3), to one to ten (1-10), depending on the length of the section. The welding of a ten-length section can be accomplished by means of one helper and three welders; each welder making three welds as the pipe is turned three times. This arrangement allows three welds to be made without moving the cylinders or shifting generator connections.

This example is given to show that the use of a high ratio of helpers to welders may be justified at times when other more profitable advantages present themselves. But as a rule, using the lowest ratio of helpers to welders in the firing line gang affords the lowest cost of operation.

After the completion of the firing line welds, the sections are ready for the tying-in or bell-hole gang. Here again it is more desirable to use two welders working opposite



Getting Ready to Lower Pipe into Trench, Using Welded Pipe Windlass.

each other whenever the size of the pipe or position of the line permits their use. These two welders can be served by one helper. Thus the ratio of helpers to welders will be reduced, as will the cost of operations.

Labor is one of the three major cost charges of each joint. Material is another one of these charges. The economical use of oxygen and acetylene depends a great deal upon the human element in welding. The use of qualified welders, that is, welders who have been tested and who can make sound welds within reasonable limits of time and gas consumption, has greatly reduced waste of gases by welders. To produce sound rolling welds the ratio of cubic feet of acetylene per pound of rod deposited should be 18 to 1 for all sizes of pipe above 4 inches diameter.

The time of welding will depend upon the size of the tip used. To maintain such a ratio it is necessary for the welder to select the proper size tip, which will give one hundred per cent penetration, and to use the pressure designated for that tip. The use of excess pressures at the gauges and throttling the pressure of the needle valves positively upsets this ratio and often produces poor welds. A neutral flame is more easily maintained with lower presures at the needle valves.

The use of a large size tip (by this is meant a tip several sizes larger than necessary for one hundred per cent penetration) enables the welder to reduce the time of welding, although maintaining the proper gas ratio with but a small increase in rod and gases consumed per joint. This increase in the amount of rod and gas required per joint is due to the increase in the width of the welds made with a large size tip. A large size tip allows the welder to maintain a larger puddle of molten metal within the protective cone and the flame. Consequently, less manipulation of the torch and rod is necessary to make the weld. These two factors must be compared: the increase of gases consumed per joint and the time saved per joint, in order to determine the lowest cost per joint. The examination of the welds made with large size tips shows them to be of the same quality of those made with normal size tips.

It can be definitely said that when welding rolling joints on pipe of 0.32 to 0.50 inch walls with a tip using from 50 to 70 cubic feet of acetylene per hour, the saving in time far outweighs the increase of the cost of gases consumed. The normal size tip for this thickness pipe would consume 20—40 cubic feet per hour. It has been noticed that when using

Bell-hole Welder Starting Weld After Joint Has Been Tacked.

large size tips, some welders are apt to increase the height and width of the weld too much. In such cases the operator should be instructed in the proper use of big tips, or be put on different work. Often it is better to shift the welders around to assemble a more nearly balanced crew.

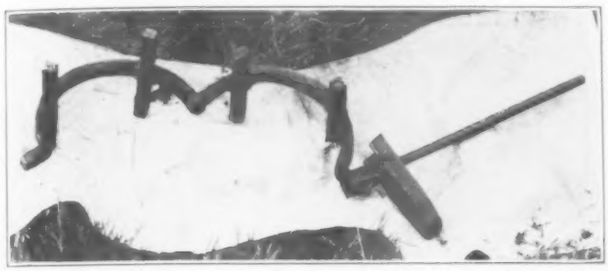
The use of generators has been a means of reducing the cost of acetylene on many pipe line jobs. In considering the use of a generator one must properly compare the additional overhead per joint with saving in the cost of acetylene per joint. Handling of cylinders in rough, hilly or swampy country greatly increases the cost of acetylene and oxygen delivered at the torch. Here the use of an acetylene generator and an oxygen manifold with feed lines extending up to 3000 feet in either direction from the generator and oxygen manifold will make the cost of gases the same as at any other part of the work. The minimum life of a portable generator can be considered to be three years of 200 working days in each year. With this asumption to base our charge for depreciation and interest on investment, it is not economical to use a generator unless the cost of compressed acetylene f. o. b. the torch is higher than three dollars ($3.00) per 100 cubic feet. The use of generators involves the transporting of a large volume of water, the need of a generator attendant, the liability of shutdowns for cleaning or repairing, the stringing of feeder lines and the moving and storing of a heavy unit. All these must be properly considered before deciding on the use of generators.

The feeder lines used for piping oxygen and acetylene are generally of 1 in. or 1½ in. pipe made up in sections 200 feet long with the outlet fittings attached. The sections can be coupled together for working in back of or ahead of the generator.

In the discussion so far, nothing has been said about the design of the joint. As the dimensions of the weld are dependent upon the type of rod used in welding, I will discuss them together. To produce good welds it is necessary and in

accord with general practise to have the pipe beveled at an angle of 45 degrees to within 3/32 to 1/8 inch of the inside wall, depending upon the size of the pipe. The pipe is then butted together and spaced. This spacing will vary from 1/8 to 3/16 of an inch according to the diameter and wall thickness of the pipe. The pipe is then tacked in a number of places to maintain this spacing, and also to hold the sections together while making rolling welds. The joints are then welded, using a rod which conforms with A. W. S. specifications and has good welding qualities.

In this connection it is interesting to note the findings



Clamp Used in Lining Up Pipe in Preparation for Making Tack Welds.

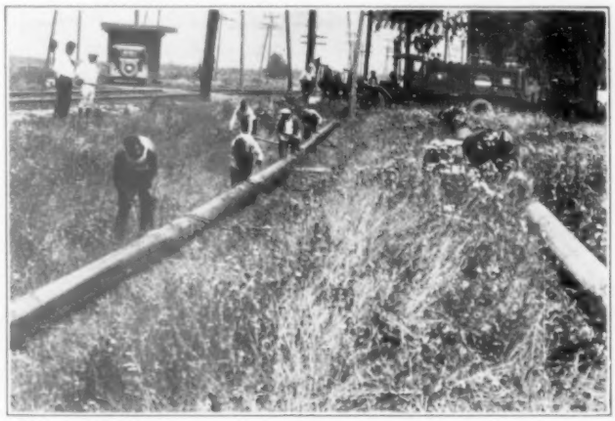
of the Research Department of a prominent rod manufacturer. They made analyses of baling wire, market wire, common fence wire, rivet wire and nail wire, nearly all of which were found to be within the limits of one of the A. W. S. specifications. We all know that such wires would not make good welds. The only way to test a good welding wire is to make welds with it and then test and examine the welds. This cannot be readily done on a field job. As an economical precaution it is best to purchase welding rods from some reliable source in order to be assured of obtaining rods which will make strong welds.

The minimum dimensions of a completed weld made with low-carbon welding rod must be two and one-half times the thickness of the pipe in width; it must be reinforced twenty-five percent on the outside of the pipe, and must penetrate 1/8 to 1/8 inch through the pipe in order to equal the strength of the pipe. As a safety precaution welders generally make wider welds with a larger reinforcement in order to offset poor penetration or poor fusion.

The use of alloy steel welding rods, commonly called high-tensile strength rods in welding joints on low-carbon steel pipe affords a worth-while reduction in the cost per joint. This reduction in the cost is afforded by a reduction in the amount of gases, rod, and time used to make a joint with high-tensile strength rod. Welds made with high-tensile strength rod on low-carbon steel pipe would be stronger than the original pipe when made to the minimum dimensions of a 100 per cent low-carbon weld as given before. High-tensile strength rod must be used in welding of high-carbon or manganese pipe which is coming into more general use, in order that the strength of the weld shall approximate the strength of the pipe. This statement may need a little amplification because actually what we try to do is to increase the difference between the load at fracture and the load at the yield point. That is if the fracture takes place in the weld it is highly desirable that the load at the time of failure be well above the load at the yield point of the pipe, and perhaps equal to or higher than the load needed to fracture the pipe. From this we can gather that it takes a smaller amount of high-tensile strength rod in a weld to withstand a given load than if low-carbon rod were used, and consequently a saving is effected in gas and time.

When speaking of overhead, let us consider only the depreciation and interest charges accruing from the equipment needed for the welding operations. These charges can be reduced by the systematic inspection and repair of the equipment in order to extend its term of usefulness. Companies selling welding equipment should be consulted for their recommendations for the care of equipment, and the recommendation should be enforced.

There are several other factors which have helped considerably in reducing the cost of welding. Using jigs for spacing and turning the pipe has materially reduced the time of



Firing Line Gang Making Rolling Welds.

welding. Roller blocks for easy turning of the pipe sections when making rolling welds has helped in the same way. Welding before trenching has also aided a great deal in reducing the time for the welding operations. Oftentimes the welding of the pipe line over the trench or alongside the excavation has made the welding operation extremely difficult, and has materially added to the time of welding.

It is apparent that there are several worth-while methods for reducing the cost of the gas welding operations on a pipe line. They are: the organizing of the labor into gangs; the reduction of the ratio of helpers to welders; the use of generators when the cost of acetylene is materially increased by cylinder handling costs; the use of proper gas pressures; the maintenance of a low ratio of gas consumed per pound of rod deposited; the use of large size tips; the qualifying of welders; the use of high-tensile strength rods; the extension of the term of usefulness of the equipment; and the use of jigs and roller blocks and the performance of most of the welding operations before trenching.

When put into practice these economies have produced stronger, more ductile and permanently leakproof joints at a cost which in many instances was far below the estimated or contract prices for other types of inferior joints.

The following is given as an example of actual costs of making rolling welds on 10-inch pipe weighing 31.9 lb. per foot on open country work.

Open Country Job on 10-Inch Pipe

LABOR: **Tacking Gang**

2 *welders* 9 *hours @ 85c per hour*	$15.30	
1 *helper* 9 *hours @ 50c per hour*	4.50	
8 *laborers* 9 *hours @ 50c per hour*	36.00	
	$55.80	
Cost per joint tacked (based on 80 joints per day)		$ .70

Welding Gang

4 *welders* 9 *hours @ 85c per hour*	$30.60	
1 *helper* 9 *hours @ 50c per hour*	4.50	
	$35.10	
Cost per joint welded (based on 44 joints per day)		.80

MATERIAL:

Oxygen 34 *cu. ft. per joint @ $1.25 f. o. b. job*	.42
Acetylene 31 *cu. ft. per joint @ 2.60 f. o. b. job*	.81
Welding Rod 1.8 *lb. @ .10 lb.*	.18

OVERHEAD:

Depreciation on equipment (based on 600 working days)	
Tacking (total equipment $200) (48000 10-inch joints)	.004
Welding (total equipment $400) (26400 10-inch joints)	.015

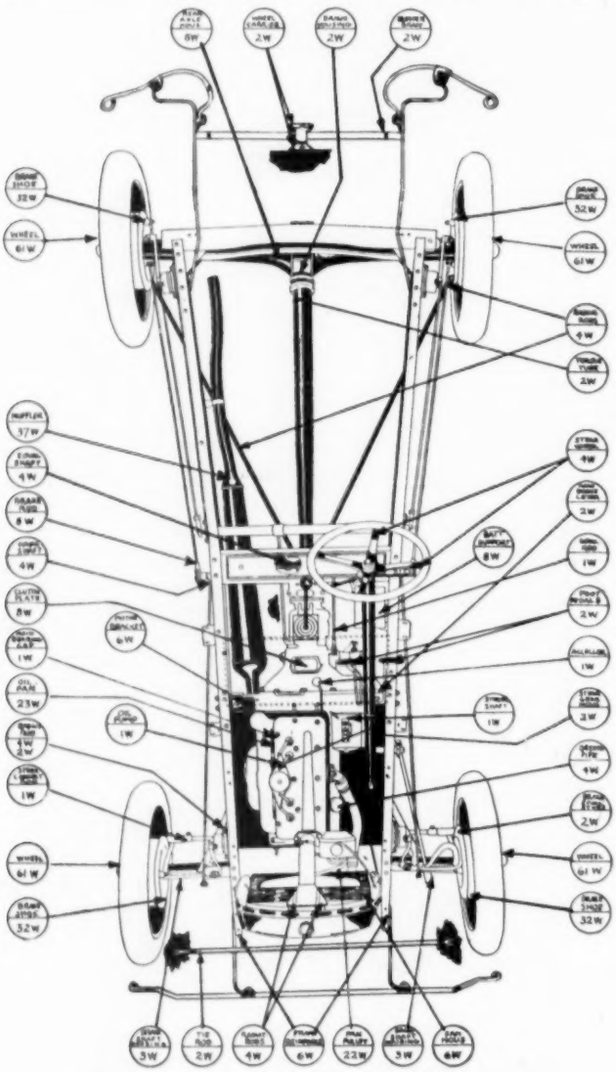
TOTAL COST PER JOINT:

(For rolling welds on 10-inch pipe open country) $2.93

There are other types of joints in an open country line of pipe, such as tie-in welds, valve flanges, fittings and drip pots, which can be calculated in a similar manner. But pipe lines with obstructions, such as river crossings, highways, railroad crossings, steep inclines, water lines, and electric conduits, are put in with different cost factors.

AN ELABORATE COLLECTION OF RESISTANCE WELDS

There is probably no other single object manufactured which contains so many different welds of varying designs as the Ford, Model A, automobile. When this car was first announced it was known that it came as close as an automobile could come to being an all-welded product and there was published in *The Welding Engineer* an article describing in detail some of the interesting applications of welding on this job, particular attention being called to the fact that the flash welding process was extensively used. Through the courtesy of Elkon, Incorporated, Indianapolis, Indiana, we are enabled to reproduce the accompanying diagram which shows the location of a great many of the welds and indicates how many welds are used on certain parts. At the time this diagram was made up it was reported that 1339 welds were involved in the manufacture of one Ford car. The photographs reproduced portray typical operations. Figure 1 is a closeup of the welding operation on the part called the wishbone. This involves the welding of a steel forging to a piece of steel tubing.



Where the Welds on the Ford Car Are Located.

Another illustration shows the welding dies opened directly after the flash welding of a rear axle housing. This is considered to be one of the most difficult welds made in the Ford plant. The third illustration was taken while a weld was actually being made. This operation is the flash welding of the steel wheel rims. It will be readily appreciated by those who are familiar with operations of this type that this work is very hard on the clamping dies. For this reason many of these dies have been faced with Elkonite, which has increased their life many times over. This facing or inlay shows up in the photographs as the light portion of the clamping dies. Referring again to the diagram of the chassis it is evident that the ingenuity of the Ford welding engineers is not greatly disturbed by the apparent obstacles of difficult shapes, and the welding problems involved in the joining of dissimilar metals. Some way has been found to overcome the particular difficulties involved in each separate welding operation and this made possible the maintenance of a splendid production schedule.

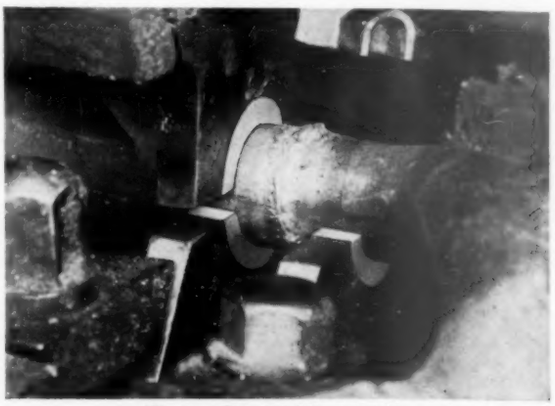


Fig. 1. The Wishbone Weld.

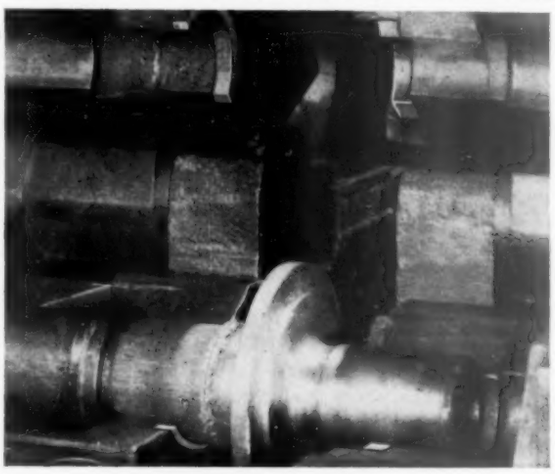


Fig. 2. Rear Axle Housing.

Fig. 3. Flash Welding Steel Wheel Rims.

HURRICANE PROVES STRENGTH OF ARC WELDED STEEL CONSTRUCTION

The completely arc welded steel framework of a large fruit packing house in Florida proved a tartar to a terrific hurricane which laid low all buildings of ordinary construction in the immediate vicinity. The packing house was in the process of construction at the time of the hurricane. The arc welded steel framework, partly of steel arch construction, was entirely completed, with the exception of the roof purlins, of which about half were in place. The major portion of the masonry was finished. The steel bar joists were also in place, having been tack welded to the supporting beams. The hurricane approached the building from the rear, blowing in the rear wall, going through the entire length of the structure and blowing out the front wall.

Fig. 1. Where the hurricane entered the structure. A concrete beam similar to the one shown in the remaining portion of the wall was blown in upon the steel framework. Fig. 2. Damage wrought to steel framework by falling masonry wall and reinforced concrete beams. A severe test which proved the strength of arc welded steel construction. Fig. 3. Proof that arc welded connections are as strong as the members they join. The bar joists were welded to the beam; the beam welded to the steel columns. None of the welds in the connections were fractured by the force of the falling wall.

The rear wall which was blown in is shown in Figure 1. This scene was photographed after much of the debris was cleared away; however, portions of a reinforced concrete beam, similar to the beam in the remaining portion of the wall, can be seen through the openings in the standing portion of the wall. Some idea of the damage wrought by the falling rear wall and the reinforced concrete beam may be gained from Figure 2. The rear wall was blown on top of the end bay which was entirely framed ready for metal lath and concrete slab.

As mentioned previously, the bar joists were held in place on the supporting beams by short fillet welds along the edges of the bearing plates at the end of the joist. Even though the entire wall fell on these bar joists, causing them to bend almost to the floor slab, the welds held the joist to the beams, causing even the beams and the supporting columns to become badly distorted. In order to clear away the wreckage, it was necessary to cut the bar joist from the beams, the welds still being in practically perfect condition. Figure 2 shows workmen cutting away damaged bar joist with gas torch.

Another view of the beam, shown in Figure 2 before the bar joist had been cleared away, is given in Figure 3. This illustration shows clearly the extreme distortion of the beam which is joined to the 6-inch H-column encased by a partition wall. A close inspection of the beam to column connection, shown in Figure 2, will reveal that the force was transmitted clear through arc welded beam to column connection, causing the beam in the adjacent bay to become slightly distorted. Figure 3 clearly shows the damage to the partition wall caused by the distortion of the column.

The tremendous force which twisted the beams and columns did not affect the arc welded connections, none of the welds in these connections being broken. The sketch shown in Figure 4 shows the detail of typical beam to column connections. Angles, 4"x4", were arc welded to the faces of the column flanges to form the beam seats. The beams were butted against the faces of the column flanges and joined to the columns by fillet welds, as indicated in Figure 4.

Another advantage of arc welded construction over riveted construction was the ease of replacement and repair to the distorted members of the steel framework. The H-column, shown in Figure 2, was distorted for a distance of three feet from its top. This distorted portion of the column was cut off with a gas torch. A new section was spliced to the remaining portion of the column by simply placing the top section on top of the remaining part of the original column, forming a butt joint which was then arc welded. A continuous weld around this butt joint made the spliced column a solid steel column. Due to the fact that no shop fabrication or punching of members was required for the arc welded construction, it was possible to obtain new steel direct from the warehouse ready for erection.

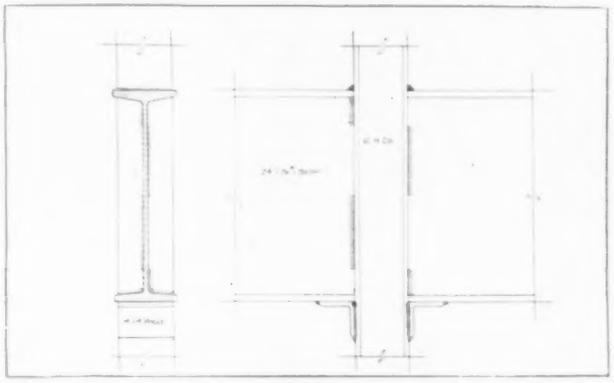


Fig. 4. Detail of arc welded beam to column connection.

The structure was erected by The Arch Engineering & Construction Company, Orlando, Florida, who used three "Stable-Arc" gas engine driven welders, manufactured by The Lincoln Electric Company, Cleveland, Ohio, to supply the current for arc welding the steel structure. Approximately 1,200 pounds of welding electrodes were used in the fabrication of the steel framework.

NEW GAS COMPANY IN TORONTO

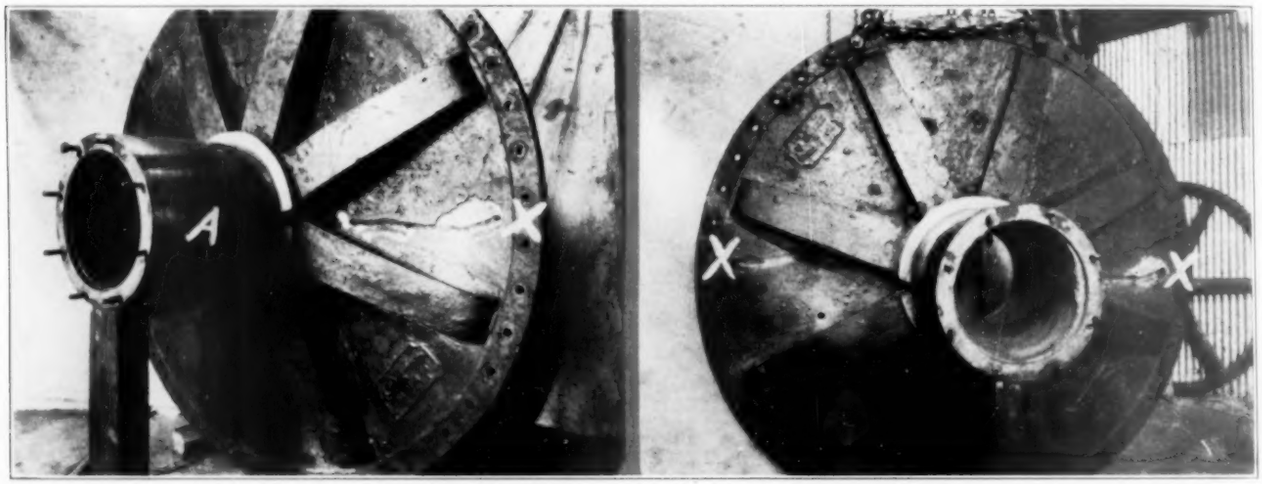
A new company called The Canadian Gas & Equipment, Ltd., with an authorized capital of $350,000, has been organized at Toronto for the purpose of manufacturing acetylene, oxygen, hydrogen, nitrogen and other rare gases. In addition to the manufacture of gas the company will also manufacture and distribute all equipment and supplies necessary to the use of its various gas products in industry. The new company will take over the acetylene and oxygen plants of the present Canadian Gas & Equipment, Ltd., at Toronto and Montreal and will also take over the plant of the Harris Abattoirs, Ltd., which produces both oxygen and hydrogen. The president of the new company is A. F. Wall; Vice President, H. C. McClellan and the Secretary-Treasurer, W. C. Wall. J. S. McLean, President of Canadian Packers, Ltd., is Chairman of the Board.

Hints for the Welder

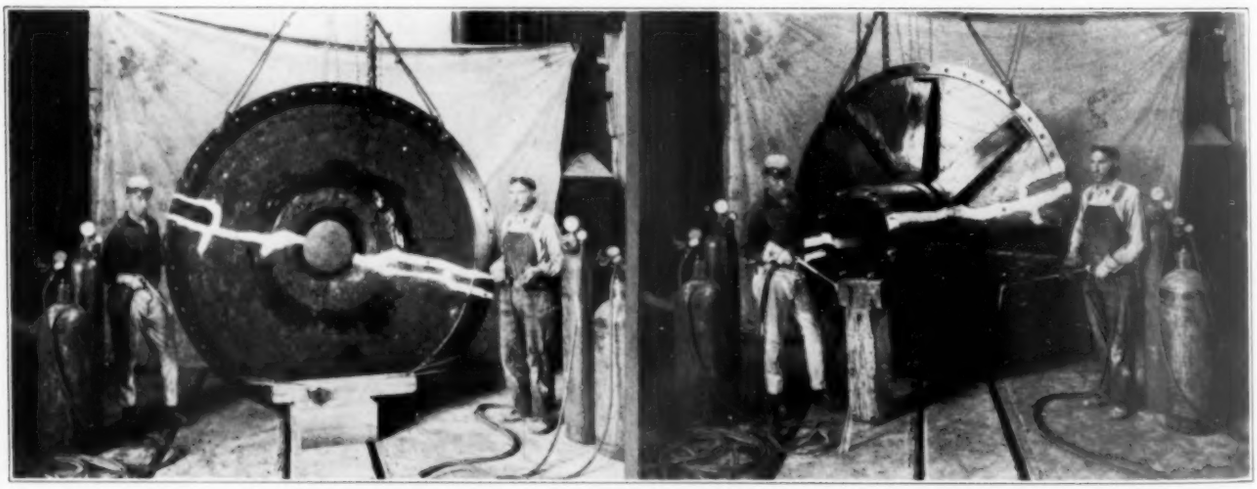
WHEN YOU FIND a new way to do a hard job, or finish a particularly interesting weld, can you describe how the work was done? . . . . . Have you learned some little stunt every welder ought to know? . . . . . Write to us about these things . . . . . This department helps you welders to help each other. Write up your ideas any old way and just make rough pencil sketches . . . . We'll fix them up for publication.

A DIFFICULT CASTING REPAIR

For the information of those interested in the welding of large castings, the casting shown in the accompanying photographs is one of two heads used on the ends of tube mills, the mills being used for the grinding of ore or rock of various kinds into a pulp. This particular casting weighed 4,000 pounds and is made of grey cast iron.



Figs. 1 and 2. Views of the Cracks After Being Chipped Out for Brazing.



Figs. 3 and 4. The Two Sides of the Casting Showing the Amount of Brazing Done.

The cracks shown in Figures 1 and 2 were the result of internal strain in the casting itself and not due to any excessive load or working strain, and, therefore were very slow in developing: in fact it had been in use for a period of twelve years before the crack was noticeable, but developed to the proportion shown within a short time after starting. Figures 1 and 2 show the fracture chipped, ready for welding.

The casting was heated at "X" and the weld started at "A", Figures 1 and 2, with the usual procedure of bronze welding. This was accomplished and a reasonable amount of protection placed over the casting when the weld was finished. However, the casting cracked, pulling away from the welds. It was then decided to preheat the entire casting, re-chip and again proceed. This was done and the entire casting placed in lime for a period of fifteen days, at which time the lime was removed, only to find the casting

cracked as before. Not discouraged with the idea that the welding of this casting was impossible or impractical, a general survey was made of the causes of failure, and being convinced that an excessive internal casting strain was responsible for the unusual condition, it was decided to cut the remaining section at "A" and "X" on both sides, completely parting the casting. When the cuts on each side at "A" were made it was plainly noticed that a terrific strain was pulling at the center of the casting which caused a shearing action at "A" and "X". This showed plainly why the ordinary procedures and precautions were failures. The casting was then placed in perfect alignment, with the customary allowance at the opening for contraction, and the welding proceeded, with the result that a perfect weld was accomplished as shown on Figures "3" and "4", of both sides of the completed weld.

225 pounds of Manganese Bronze was used in making this weld.

The casting has been placed in service and undoubtedly is as strong as a new one, with no defective strains of any kind.

It is estimated that a saving of 50 per cent can be effected in reclaiming a casting of this type with the use of the Acetylene Welding Process.

CUTTING 48" CAST IRON SEWER PIPE

By. E. B. Heyer

It was on a Wednesday when we were called up by a prominent contractor of our community, and asked to look over a sewer pipe which had to be cut, while in use, the coming Saturday after midnight. It was Thursday before we got down to see the job and here is what was ahead of us. Located 25 ft. from a busy thoroughfare was the conjunction of two sewers, one the old 48" line, and the other a new 60" sewer which connected with the old one

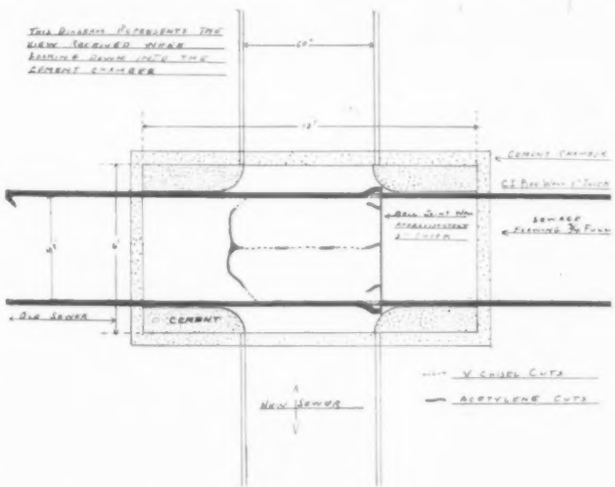


Diagram Showing Location of Cuts Made in the Sewer.

inside a cement casing. The casing or box shaped compartment was about 6 ft. by 12 ft. in width and 10 ft. high. The entrance to this chamber was by a standard manhole located at one end of the cement compartment and about 18 ft. from the floor. In such a small space there was only room for one man at a time blasting cast iron, and the job had to be done in not more than 5 hours.

We started the men working Saturday with an air chisel cutting a V groove half way thru the inch cast iron pipe wall, and it was the layout of this chisel cut that made the job so successful. This sewer works under pressure during the day and only drops to about ¾ full at 2 A. M. which was when we were scheduled to be well under way.

At about 7 P. M. the chiseling was more than half done and we had towed our portable lighting unit to the job and left 3 sets of oxy-acetylene cutting outfits ready to use. We drilled out the largest air cooled cutting tips that come so as to get a larger flame, and our only trouble was that the regulators would hardly pass the required amount of gas and oxygen. Outside of this and having to keep a pail of water handy in which to cool the tips, and saturate our gloves, no other unexpected trouble was encountered.

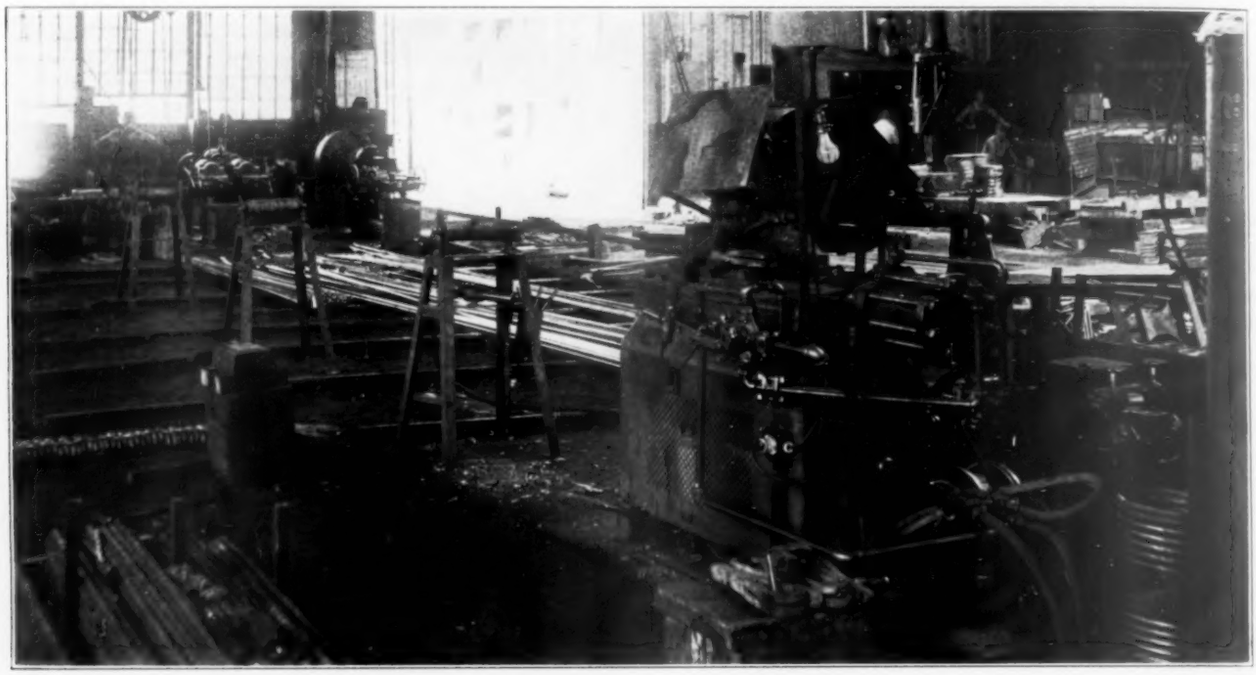
We arrived on the job at about 1 A. M. and already the half dozen laborers were there ready to be of assistance if necessary. We started up the lighting unit and strung out a few lights, after which we hooked up the torches, put on our gloves and climbed down. It was then we realized that only one man could work safely there, and his position was not as comfortable as it might have been. The danger was in the chance of the pieces we were cutting out falling into the flowing water and partly blocking it. If that were to happen the compartment would fill up almost faster than a person could climb out. The other dangerous element was the fumes which arise from blasted cast iron and the fumes from the melting lead in the bell joint. A man could blast for about ten or fifteen minutes before he felt the effects of these gasses, after which it was necessary to "Air Out" for relief. Taking turns that way kept the work going right along and after about three hours with the torch, down there in the terrific heat that filled the chamber, our part of the job was done. We had accomplished just this; —The pipe we were cutting ran lengthwise with the chamber on the floor and the new pipe entered the side at right angles. This pipe was to take over some of the flow from up the line and in that way relieve a weak section in the old sewer. The new sewer was to be tapped in up above after we made our cut, therefore, when we started work the chamber was practically dry. The section to be taken out was 6 ft. long and as far around under the pipe as possible. It was decided that an opening to the water line was all that could be accomplished, but we laid the chisel cuts as far under as a man could handle the air chisel and hoped to open the pipe there. Another V cut circled the pipe at one end of those chisel lines connecting them. Then a V was cut lengthwise down the pipe connecting the end cuts and the seam of the bell forming an oblong pattern, with a connecting cut lengthwise. Our job was to blast thru the heavy section of the bell joint where the 3 chisel cuts ended. At the other end the cut began on top of the pipe and followed the chisel V in each direction down to the water line. The water cooled the pipe so fast that we could cut no further. We then cut three 6 inch slots equally spaced along the top chisel V and called down the stopehammer operators to finish the job with wedging and pounding. After about an hour with the air chisels digging into the cuts we had made, the pipe began to crack thru the chiseled sections, and finally broke out in two halves, just where we had made the chisel cuts. The two pieces were about 3 ft. by 6 ft. in size and consumed half an hour's time to remove them. The entire job took just about 4 hours to complete with the pipe running ¾ full.

In about a month the relieved section will be diverted thru a complete new sewer and we will then finish the necessary trimming to conform with the inside of the cement compartment.

USE BUTT WELDER ON TOWER RODS

A new electric resistance butt welder has recently been installed in the east end of the machnie shop of the Chicago plant of the Chicago Bridge and Iron Works. This plant has for many years been using electric arc welding on a large scale in connection with the construction of large storage tanks

and special roofs for the huge oil storage tanks used in the oil fields. Therefore, they are well known in the welding industry on account of their extensive activities in both shop and field welding. A resistance welder has been put in operation for the purpose of welding loops and eyes on the tie-rods used in tank towers. On account of the number of different sizes of the tanks supported by towers, the welding machine has a considerable range of work. A complete tie rod consists of a long rod with a loop welded on one end and a threaded section welded on the other end, and a short end made by welding a loop end to a threaded round rod, and a turn-buckle for coupling the long and short ends together. There are, therefore, three welds for each complete rod and eight rods are used in one section of the tower. The diameter of the rod varies somewhat, the maximum being about 2 in. square and averaging about an inch and a half. There is, of course, some skill involved in butt welding a section 1 in. square to a round rod of corresponding diameter. Provision for the difference in sections is made in the design of the machine; and in the operation care is taken to preheat the bigger section thoroughly before making the final push-up. Immediately after the weld is made a pneumatic chipping tool is used to chip off the excess metal while it is still hot. Then it is given a uniform shape by a few blows with a hammer and set aside for inspection before it is pointed for shipment. At the left of the welding machine in the illustration can be seen rollers mounted on horses. These serve to support the long rod in the horizontal position while the weld is being made, thus relieving the clamping dies of all unnecessary strain. Directly underneath the roller nearest to the welding machine can be seen the air tool ready to do the trimming just as soon as the welding is finished.



Resistance Butte Welder Used in Fabricating Tie Rods.

REPAIRING MILLING CUTTERS

By Geo. T. Kerr*

There are numerous ways in which fusion welding can be used in the repair of cutting tools. We use a High Speed Steel metal cutting saw for brass and copper tubing. When a tooth, or teeth, break out, we build up a new one, using Stellite and an acetylene torch. Rough grind the excess metal and finish grind on a surface grinder. These saws are ⅛ in. x 7 in. and cost $13.85 each. A pad of wet asbestos built up as near the welding point as possible will help in keeping the warpage to a minimum although a slight warp does no harm, as the saw runs at high speed and straightens itself. The saw together with the welded portion stands up as well as when new.

End mills of large enough diameter to warrant repairing are first ground out to receive the weld metal. We heat the tool to a bright red and apply three and one-half per cent nickel steel, then anneal the whole piece, re-machine the teeth to shape, cut down the built-up teeth about ⅛ inch, and apply Weldite Type T with the acetylene torch, cool slowly in lime and re-harden the tool, re-grind and put in service.

Milling cutters, such as straddle mills, where one or two teeth are broken out, we build up with the electric arc, using Stoodite, re-grind to shape and put back in service. These cutters may not be quite as hard on the built-up teeth, but they seem to last as long and give as good service as new ones. We also have made large cutters using machine steel and applying Stellite to the tips of the teeth. Where high speed steel is the base to be built up, such as tools for boring cylinder blocks, or for counter boring heads, heat the steel to at least a dull red before applying Stellite or Stoodite and cool slowly to prevent cracking. Both Stellite with acetylene and Stoodite with the arc can be applied so that few if any pin holes can be found.

*McIntyre & Kerr, Tungsten Carbide Tools, Berkeley, Calif.

SUTTON-GARTEN IN NEW BUILDING

In order to take care of the ever increasing demand for welding and equipment service, the Sutton-Garten Company has just completed a new modern fireproof building—one of the best of its kind in the Middle West.

The Sutton-Garten Company distributes K-G Welding and Cutting Equipment and USL Arc Welders—and also maintain one of the most up-to-date job welding shops in the Middle West.

This plant has four electric welding outfits mounted on trailers that can be towed to the job and left there. In the shop there are always two stationary outfits and one Spot Welder. Every trailer also has as part of its equipment an oxy-acetylene outfit for cutting and a welding torch.

Progress in Cutting Under Water

Cutting Torch in Frequent Use in Numerous Industrial Projects Throughout the Country on a Standardized Service Basis

By Charles Kandel*

THE underwater cutting torch, using oxygen, hydrogen and compressed air for cutting steel under water, originally developed in the salvaging of the U. S. Submarine S-51 in 1926, is being called into daily use on numerous industrial projects. In some cases the torch is used for routine work, in others it is the means of eliminating costly and laborious operations and at times its use is indispensable for completing

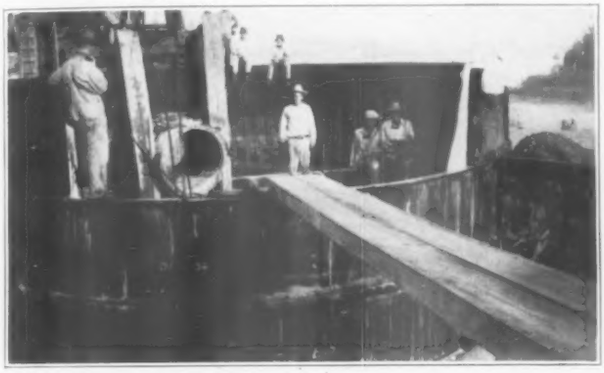


Fig. 1. Scene of Operations at Melville, La., Where 48-inch Girders Inside Caisson Were Cut.

a project. Ordinarily the savings resulting from its use run into many thousands of dollars. But regardless of the exact value of its service, it is available at a reasonable cost on a flat-rate, rental basis, together with all necessary accessories and auxiliary equipment, including diving rig. With the equipment, there is placed at the disposal of those renting it the services of one or more expert divers and tenders skilled in its use, who can be employed at per diem rates only slightly higher than the prevailing rates for first class commercial divers and tenders. While the engagements undertaken have been of a widely varying nature and some have been unique, all have been completed with satisfaction to everyone concerned. Invariably the testimonials resulting have been a tribute to the dependability of the equipment supplied as well as to the courage, skill and industry of the seasoned navy men who did the actual work called for.

As a result of the wide experience in the operation of the torch during the last three years, a number of engineers have come to depend upon it more and more as a daily tool and its use is being specifically called for in both large and small projects. The complete service for cutting steel under water —any thickness, any depth, anywhere—is now available at a definite and reasonable cost for a day or a year, without need of costly preparations or additional surface equipment other than what is usually found on any such construction job. *York, N. Y.*

The following is a partial list of *typical concerns* who have the Ellsberg Torch or auxiliary equipment has been used:

(1) Salvaging of the U. S. Submarine S-51.
Cutting Conning tower, part of Superstructure, Anchor Chain, Steel Cables, Pontoon Toggle Bolts, etc., etc., at 138 ft. depth in open sea.

(2) Reconstruction of High Bridge on Harlem River.
Cutting Steel Bulkhead in the dry, against the incoming water, at a depth of 4 to 6 feet.

(3) Construction of Perth Amboy-Tottenville Bridge.
Cutting Steel Sheet Piling forming part of cofferdam at a depth of 22 feet.

(4) Salvaging of the U. S. Submarine S-4.
Cutting part of Superstructure and air inlet vents to match flanges, etc., at a depth of 105 feet in open sea.

(5) Construction of Power House on Long Island Sound.
Cutting Steel Sheet Bulkhead in midwinter at temperatures as low as 13 degrees F., at a depth of 25 feet.

(6) Construction of Railroad Bridge Caisson.
Cutting 48-in. girders and other structural steel totaling about 15 tons inside caisson, at a depth of 95 feet, on bottom of mud and quicksand.

(7) Reconstruction of Steel Trash Rack at Inlet to Hydroelectric Plant.

Fig. 2. Operator Fully Equipped for Cutting of Wrought Iron hull at Bayonne, N. J. Fig. 3. Cutting Steel Sheet Piling at Glen Cove, Long Island.

Cutting 24-in. I beams lined with 4-in. oak lagging on both sides of webs, and miscellaneous channels and bars totaling about 25 tons, drilling holes in concrete, setting templates, etc., at a depth of 25 to 70 feet in water at 32 degrees F.

(8) Inspection of Hydroelectric Inlet.
Jetting with balanced high pressure nozzle—VeVac Model, caulking inlet gates, etc., at a depth of 90 feet, at a temperature of 32 degrees F.

(9) Inspection of Submerged Hull and Plotting location.

(10) Clearing of Channel Obstruction.
Complete cross section of stern of wrought iron hull 45 feet wide totaling about 90 tons, at a depth of 25 feet.

(11) Construction of Dry Dock.
Cutting Steel Sheet Piling to provide overflow at a depth of 3 to 5 feet.

(12) Clearing Foundation for Highway Bridge on Bronx River.
Jetting with balanced high pressure nozzle—VeVac Model—at a depth of 15 feet.

(13) Dredging Bottom of Lake to meet requirements for increased depth.
Breaking up hard pan around dredge intake with balanced high pressure jetting nozzle—VeVac Model.

*General Manager, Craftsweld Equipment Corporation, New York, N. Y.

(14). Construction of Sewer Outlet on Harlem River.
Cutting Steel Cofferdam located in sewer outflow with zero visibility at a depth of 6 to 15 feet.

(15) Construction of Dry Dock.
Cutting of Steel Sheet Piling to provide for extension of cradle at a depth of 2 to 4 feet with zero visibility

(16) Placing of Caisson (40x90 feet in Cross Section) at a depth of 75 feet.

Fig. 4. 24-inch I Beams Lined with 4-inch Oak Lagging.

Cutting and Fitting Pipe, Drilling Heavy Timbers, Jetting with balanced high pressure nozzle—VeVac Model, etc., incidental to resetting caisson which had been overtaken by flood.

On each of the above projects one or more outfits was supplied, together with expert divers and competent tenders. The length of service varied from a minimum of one day to a maximum of 45 days.

The following is a partial list of *typical concerns* who have called for the service on one or more occasions:

Aluminum Company of America, Pittsburgh, Pa.
Cox, P. T., Contracting Co., Inc., 154 Nassau St., New York City.
Hardaway Contracting Co., Columbus, Ga. (Johnsonville, Tenn., Project).
Missouri Valley Bridge & Iron Co., Leavenworth, Kan. (Melleville, La., Project).
Phillips, E. L., Co., New York, N. Y. (Long Island Lighting Co Plant).
Roberts, E. O., Co., New York, N. Y.
Snare, Frederick, New York, N. Y.
Spooner, Allen N., & Son, Inc., New York, N. Y.
Tidewater Oil Company, Bayonne, N. J.
Todd Ship Yards (Robins Dry Dock), Brooklyn, N. Y.
U. G. I. Contracting Co., Philadelphia, Pa. (Vicksburg, Miss., Project).

A Complete Outfit for cutting steel under water usually consists of the following, which may be packed in two hand bags totaling about 75 pounds:

The Ellsberg Torch with 90 degrees, 75 degree or straight head in lengths varying from 15 to 36 inches or more, as may be required

Assortment of tips suitable for varying characteristics and thicknesses of steel and depth and condition of water to be encountered

Oxygen and hydrogen manifolds with necessary regulators to enable the diver to work continuously for the full diving period permissible at the depth of operation.

Compressod air regulator for the control of compressed air at whatever pressure it may be available on the job.

Necessary lengths of heavy duty, cord reinforced hose for the operation of the torch at a convenient distance from the base.

Sufficient spares to provide for reasonable contingencies.

Underwater Torch Lighter using 110 volts 10 amperes, desirable for deep water or where operations are carried on at a considerable distance from the diving base.

The Auxiliary Equipment consists of the following:

Complete Diving Rig suitable for the operation in hand, including helmet, breastplate, several dresses, shoes, weighted belt, air line with control valve, life line, etc.

The above is generally packed in three cases:

One containing helmet and breastplate weighing about 40 pounds.

One containing shoes and weights totaling about 125 pounds.

One containing balance of equipment and accessories weighing about 250 pounds.

Diving Pump—encased, weighing about 400 pounds.

Two Fly Wheels, each weighing about 100 pounds crated.

Submarine Searchlight (using 110 volts 10 amperes) with necessary cable and spare bulbs—300 watts—desirable for increasing the visibility under water.

Submarine Flashlight with spare batteries, used for inspection work and where the cost of supplying necessary current for the searchlight is prohibitive.

Balanced high pressure jetting nozzle—VeVac Model—for clearing and exposing work, dredging, etc., operating on water pressure up to 200 pounds, supplied through ordinary hose having a 2 or 2½ inch I. P. coupling. This nozzle is slightly self-propelling and can be held by a diver with one hand regardless of the pressure.

The necessary supplies for the cutting of steel under water with the above outfits consist of the following:

Oxygen gas in cylinders, same as used for surface operations.

Hydrogen gas in cylinders, generally obtainable wherever oxygen gas is available.

Compressed air at any pressure available but not less than the water pressure at the point of operation.

The consumption of oxygen, hydrogen and compressed air will naturally vary just as it would on land. The factors influencing consumption are: character of steel, nature of coating, such as paint, rust, or other refractory material, depth of water, extent and character of polution, speed of current or tide, visibility, etc. The actual consumption recorded on numerous operations show variations as follows:

Oxygen—180 to 240 cu. ft. per hour of actual operation of the torch.

Hydrogen—200 to 300 cu. ft. per hour.

Compressed Air—600 to 800 cu. ft. per hour

On production work, such as cutting steel sheeting under average conditions at normal temperatures (60 to 80 degrees F.), with a current under 2 miles per hour, at a depth of not over 50 ft., a diver can work an average of 5 to 6 hours actually under water in an 8-hour working day.

At a greater depth or under more rigorous conditions of tide, current or temperature the actual working time under water for continuous operation must be reduced just as it would be for any other diving operation.

Electric Current, 110 volts 10 amperes, if readily available to be used for the searchlight and torch lighter where desired

Water, at a pressure of 100 lbs. or more, for the operation of the High Pressure Jetting Nozzle (having a ⅞ in. diameter outlet) when it is necessary to use it for clearing, excavating or trenching.

The *usual facilities* necessary for carrying on operations including the following:

Diving platform, raft or scow with adequate space and shelter for dressing, for the operation of the diver's pump and

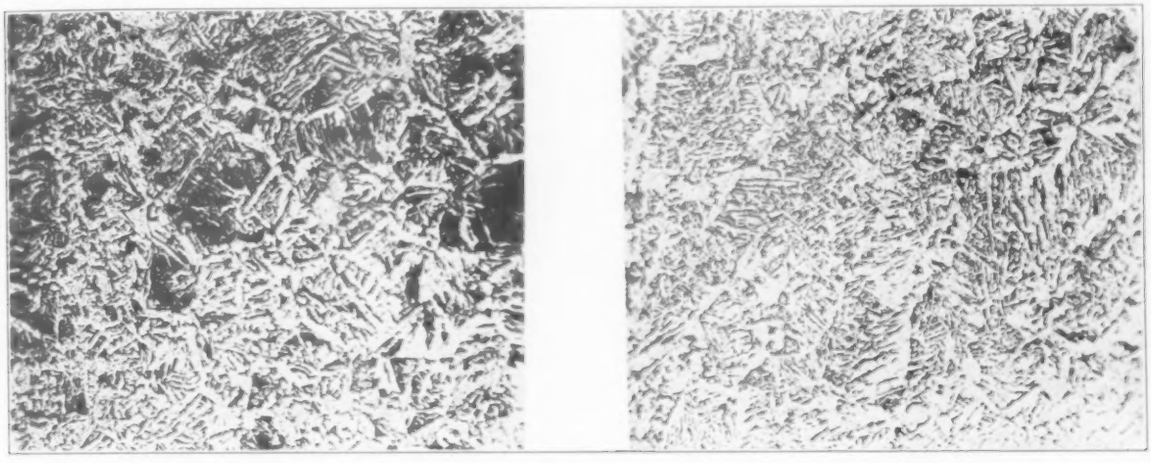
for the storage of the oxygen and hydrogen cylinders actually in service. The pump and cylinders may be stored adjacent to the diving base.

Suitable derricks for holding, pulling and lifting material out.

Surface personnel for manning the diver's pump, handling cylinders, operating derrick and otherwise cooperating with diver and his tender in speeding up the work of cutting and removing material after it is cut.

The *actual operation* of the torch is a relatively simple matter in the hands of an expert diver skilled in its use. It will cut steel at any depth with ease. Its speed is limited only in the same sense as any other mechanical operation that is carried on underwater because of the handicaps of the diver's cumbersome dress and weight, the difficult position he may be forced into when attacking the work, the limited visibility prevailing under water, the effect of current or tide, the usual low temperature of the water and the effect of depth. The diver's progress is also dependent upon the efficiency of the surface equipment, facilities and personnel serving him.

The use of this process for cutting steel under water is growing daily, in spite of the fact that the number of skilled operators is very limited. For close to three years it has been available at short notice and in every instance where it has been applied it has done the work desired without serious difficulty or delay. The wide range of projects on which it has been called into service indicate very clearly its value and dependability in construction work. And the substantial savings resulting therefrom constitute further proof that the oxygen torch is a most valuable tool wherever steel is used—on land, in the air or under water.



Left—Micro-Structure of Union Between Base Metal and Deposit Made with Slag Coated Rod.
Right—Micro-Structure of Weld Metal.

SLAG COATED ELECTRODES

The use of a slag coating, in place of a flux coating, on arc welding electrodes, has very beneficial effects on the weld deposit, according to a communication received from E. D. Fahlberg, of Arcos, Inc., La Crosse, Wis., makers of the Arcos rod. This type of rod was developed abroad, in Belgium, and has obtained a considerable use in Europe. Mr. Fahlberg points out that the slag forms a protective coat on the rod itself so that when the tip of the rod heats and melts, the hot metal is surrounded by a coating which is impervious to oxygen, nitrogen or hydrogen, or those constituents which dissolve easily and in large quantities at this critical stage.

It is claimed that the absorption of these gases at this critical point of fusion embrittles the weld. For example, when electrolytic iron is freshly deposited it contains a large amount of occluded gases, mainly hydrogen. These gases make the metal so brittle that a hammer blow will shatter the metal to bits. If the imprisoned gases are removed by heating in a vacuum the metal becomes more ductile than the softest steel.

It is the function of the slag coating to protect the inner core of the melting metal and also pass with the arc stream to the surface of the metal in the crater. It does not sink into the metal, because it is too light. The continuing presence of this slag covering acts to prevent all further possibility of any absorption of gases, particularly atmospheric gases, by the hot metal in the crater.

Another claim made for this slag coating is that it protects the solidifying metal from the temperature of the arc flame, insulating the surface of the metal from the intense radiant heat, and permitting the metal to solidify rapidly but uniformly by reason of the conduction of heat through the adjacent metal. The uniform cooling by conduction through the metal is said to produce a uniform crystalline structure.

Another point mentioned is the speed and ease of operation obtained with the slag coated electrode, the metal flowing rapidly at much lower current densities without sputtering and splashing the metal. There is little chance for the electrode to freeze because of the slag enclosed tip. As soon as the arc is struck the arc stream of slag particles offers a decreased resistance to the current as compared to air and as the resistance of a non-conductor of electricity decreases with rise in temperature whereas that of a conductor increases, there is set up a compensating increase in conductance to the decrease that takes place in the metal stream. The result of this compensating action of the coating is said to be a marked increase in the stability of the arc. The arc stream is saturated and is pulled off the entire cross section of the electrode. Compared to the erratic core type arc this saturated stable arc is advantageous for rapid and conscientious welding.

NEW ELECTRODE HOLDERS

Waters Welders, Inc., 439 West 54th St., New York City, have just issued new catalog describing in detail the Waters line of electric arc welders, combined arc and spot welders, electrodes and equipment. Among the newer items are two types of electrode holders. Type A-300 is a Tubular type, made of hand copper with no moving parts. This holder is recommended for heavy duty rough service. Maximum capacity 300 amperes. The electrode is held in a slot so that if coated electrodes are used, this coating is scraped off as the electrode is forced into holder, thereby making good electrical contact and preventing burning of tip of electrode holder. The handle is fibre, with air space for cooling. Connection with cable is made by means of a soldered screw plug, so that if electrode holder is to be replaced, no further soldering is necessary.

STEEL TUBING FOR GAS LINES WELDED INTO CONVENIENT LENGTHS IN SHOP

Oxy-acetylene welding is used exclusively in double welding O. D. pipe at the plant of the Pipe and Tube Division of M. S. Kaplan Company in Chicago. Almost all sizes of tubes are cleaned, bevel-edged and then turned over to the welder for fusing into lengths of from 30 to 40 ft.

The use of factory welds obviates, of course, the necessity

Welding Tubes in the Kaplan Plant.

for just that much welding in the field, resulting in at least three substantial economies: (1st) factory welds are cheaper per unit than field welds; (2nd) it is easier to produce strong and uniform welds in the shop than on the field; and (3rd) considerable time is saved in laying the line.

The use of this type of factory welded O. D. pipe for the transportation of natural gas, especially for branch lines, is increasing rapidly. The M. S. Kaplan Company numbers several large gas utilities among its satisfied customers.

THE UNITED WELDING COMPANY ADDS TO PRODUCTION FACILITIES

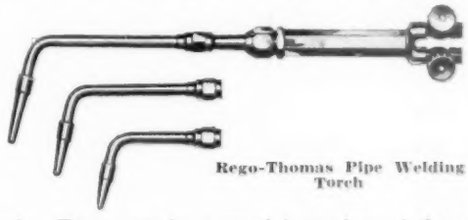
The United Welding Company of Middletown, Ohio, has recently entered upon a program of expansion in order to handle contracts for the manufacture of large diameter steel pipe by the welding process. For a number of years previous to this time they have been engaged in the welding of steel tanks and containers of all dimensions. They also engaged in production and repair welding of various other types of work for a number of the manufacturers in the Middletown district. With this well established business as a basis they are branching out into larger fields of sheet metal fabrication. One of their first steps has been to acquire a large plot of land in the southeastern manufacturing district of the city. One moderate size industrial structure was already located on this land and to this they have added two other large structures specially built to house the machinery and welding equipment for fabricating the large diameter pipe. This machinery is of the heavy type necessary for the shearing, bending, and rolling up of the ½-inch plate. The welding equipment consists of numerous electric arc welding outfits, and oxy-actetylene welding and cutting outfits. Everything is arranged for the convenient and efficient handling of the materials from the time they are sheared, through the rolling and welding processes, to the final testing and coating of the completed sections of pipe. The finished pipe is welded up in sections just long enough to be shipped on the standard size flat car. With these additions in building and equipment, The United Welding Company is now in a position to take care of a greater variety of contracts for the construction of large welded pipe and all types of welded tanks and containers.

C. T. PRICE RESUMES FORMER POST WITH G. P. A.

It is reported that Chester T. Price will assume the duties of secretary of the Gas Products Association at Chicago on September 1st. Mr. Price needs no introduction to those who have been connected for any length of time with the oxy-acetylene welding industry. He was for several years secretary of the Gas Products Association and during that period gained a considerable acquaintance in the industry. It was with deep regret that the association accepted his resignation when he left it to take a position as sales manager for the Portland Oxygen & Hydrogen Company, Portland, Oregon. The secretarial position at the association has been open for several months and negotiations having recently been completed, Mr. Price left Portland early in August for Chicago. His wide acquaintance with the entire industry and his close contact with the merchandising problems of the oxygen and equipment manufacture, give him a splendid background for a new term of service with the Gas Products Association he is just beginning.

REGO THOMAS WELDING TORCH

The Bastian-Blessing Company, Chicago, manufacturers of oxy-acetylene welding and cutting apparatus, have recently put on the market a new type of torch called the Rego Thomas torch. The new construction and operating features of the new torch were designed by Roy Thomas of California, who is well known as an expert welder, and has been engaged in the apparatus business for several years. Through a special principle of construction, invented by Mr. Thomas, it is possible to obtain a very long and very hot flame with a small,



Rego-Thomas Pipe Welding Torch

light torch. For example, a special number of the new type, which is made for pipe welding, is only 15½ in. long and weighs 18 oz. This can be supplied with a special cutting attachment so that the same torch can be used for both welding and cutting. It is claimed that it is entirely practical to cut ½ in. plate at 10 lbs. oxygen pressure. The same torch will produce a flame small enough to weld light sheet metal, or large enough to weld sections several inches thick. That is, the length of the flame can be varied from a tiny short one to 1½ in., without changing the tip, and the change from welding to cutting can be made without changing the regulator. An especial point made regarding the new torch is the prevention of back fire or flash back, this feature being constant whether the pressures are high or low, balanced or unbalanced. The new torch is strongly made, and offers a wide range of usefulness in a tool which is light and well balanced.

A NEW HARD SURFACING ROD

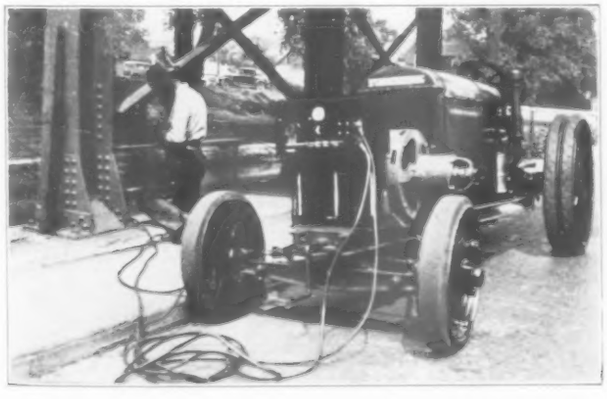
One of the latest developments in the line of the Fusion Welding Corporation of Chicago, is a series of welding rods listed as Weldite Type "T". The function of this rod is to produce abrasive resistance deposits. The rod contains about 75 per cent iron, the remaining 25 per cent being made of various other elements which give the weld deposit the desired properties. It is said to be a very delicately balanced alloy depending for its properties on the ratio of carbon and

alloy content rather than directly on either the carbon or alloy content. The hardness and general wear resisting properties of the deposited metal depend to a considerable extent upon the use of the correct technique of application. For example, it has been found that if an unnecessary amount of heat is used so as to fuse more metal than is required to make a good union between the deposit and the base metal the deposited metal will then be somewhat diluted by the molten base metal. It is pointed out also that the hardness can be controlled over a considerable range by controlling the carbon content.

This new metal is made for both gas and electric welding. The gas welding type is designated as type T-G. Since the nature of the rod makes it necessary to use a flux for good results, and since it is necessary to supply flux in exactly the correct quantity, it has been found from experience that the most satisfactory method of use is to furnish the rods already coated with the necessary flux. In addition to using the flux coated rod it is also recommended that a slightly carbonizing flame be used for the welding. The rod developed for electric welding of this material is designated as Type T-E. This rod is used with reversed polarity and the recommended technique is to apply it in pads approximately an inch wide, building up the entire thickness required in one layer if possible. It has been found that Type T applied with a welding torch will produce deposits which show approximately 600 Brinnell hardness. When applied with the electric arc the hardness is slightly greater. Slow cooling decreases the hardness so it is sometimes advisable to accelerate the cooling rate, and where conditions prevent this to resort to heat treating after welding.

WELDER-TRACTOR COMBINATION

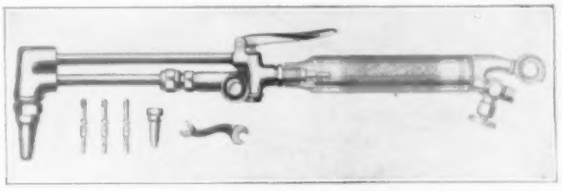
The new Lincoln Stable Arc Welder mounted on the McCormick-Deering Tractor is announced by the Pontiac Tractor Company of Pontiac, Michigan. This unit is furnished in either the 200 or 300 ampere machine and gives a wide range of utility. The extension frame in this mounting is such that



the tractor is simply set into a 4-inch I-beam frame and the front axle assembly is set ahead under the frame thereby lengthening the wheel base. This construction reinforces the tractor and gives it balance, making it easy to steer with the added weight. The welder unit complete with the panel is mounted on this frame member ahead of the tractor and takes its drive from the power pulley at the side of the tractor by a belt. This makes a compact self-contained unit capable of moving about under its own power. The 48x4 dual tires used in the rear give this unit a road speed of 15 miles per hour.

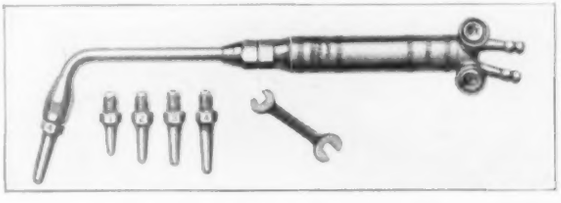
NEW TORCHWELD MODELS

During the past year the Torchweld Equipment Co., Chicago, manufacturers of oxy-acetylene welding and cutting equipment, have added several new types of torches to their line, which will be demonstrated in the Torchweld exhibit at



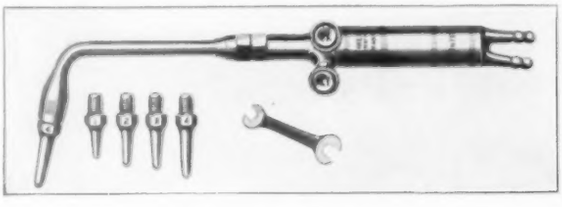
No. 750 Cutting Head for Torchweld Welding Torches.

the National Metals Exposition in Cleveland this month. One of the new features is the No. 750 cutting head for Torchweld welding torches. There are seven styles of Torch-



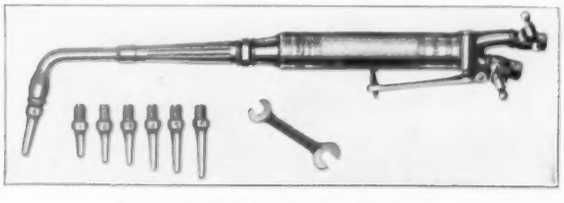
No. 30NF Non-Flash Welding Torch.

weld welding torches to which this cutting head can be attached and thus make them available for cutting operations, the capacity of this cutting head being 8 in. in thickness. The outfit consists of the cutting head, a standard nozzle sleeve, three tips of varying sizes and a special wrench.



No. 40NF Non-Flash Welding Torch.

One of the new welding torches is Type 30 NF. This has been designed for use in aircraft, automobile body, fender and light sheet metal welding and brazing. This torch is 11 in. long and weighs 10 ounces and is supplied with welding tips in four sizes. This is constructed with the needle



No. 21NF Automatic Welding Torch.

valve controls at the rear of the handle. The companion torch to this one is the No. 40 NF of the same size and weight, and designed for use on the same types of light work as the 30 NF, the difference in construction being that the No. 40 has the needle valve control at the forward end of the handle.

Another new feature is the No. 21 NF automatic welding torch. This is made especially for use on production weld-

ing. It is equipped with a special valve arrangement which extinguishes the torch when not in use, but immediately re-lights it without adjustment of the needle valves when it is time to resume welding. The model shown in the illustration is 15 in. long and weighs 16 ounces. It is supplied with welding tips of six sizes. The new types of welding torches have been designed primarily to meet the requirements of production welding in aircraft and automobile factories, but have gained considerable popularity in plants doing all kinds of light sheet metal welding and brazing. Both the welding torches and the automatic cutting head are equipped with a safety flash-back chamber which prevents flashing of the gas through the torch into the hose and regulators.

NEW MILBURN ACETYLENE GENERATOR

There has recently been placed on the market, by the Alexander Milburn Company, Baltimore, Maryland, a new Portable Acetylene Generator for welding and cutting. The Generator is unique in that the body is made throughout of drawn seamless steel which makes the generator lighter than usual in weight. It is made in three sizes—35#—70# and 100# capacity.

The Generator has been scientifically developed and has undergone a series of laboratory tests by the Underwriters' Laboratories, Incorporated.

The Generator is extremely simple, it has no clocks, or motors and notably few moving parts. Carbide hopper feed control and head are assembled in one unit which can be detached from the seamless steel body by the removal of a few bolts. The carbide feed is controlled by a single valve which responds to high or low pressure and automatically stops if the pressure is at zero, or if the filler plug is open or the generator is not properly closed.

The control and operation of the generator is so simple that the carbide feed is uniform and a complete consumption of the entire charge of carbide is assured.

The safety features of the generator under various conditions of usage, upsetting and tipping over is one of the notable features of this generator. The Underwriters' Laboratories made tests by tipping the generator at different angles, throwing it over under different stages of operation without causing a rise in pressure of the gas or abnormal working of the machine.

The machine is equipped with well developed blow-off valves, pressure control, safety gas purifier and strainer. The component parts of the machine are made with oversize outlets all welded into the seamless body of the generator.

The body has a protective coating inside and out. Handles of ample size, welded on to the body, provide for the convenient transportation.

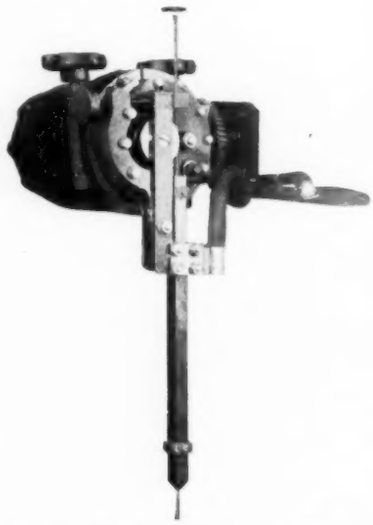
THE NEW WESTINGHOUSE WELDOMATIC

The Westinghouse Electric and Manufacturing Company announces the development of the "Weldomatic," a new and improved automatic welding outfit. The Weldomatic equipment is complete with electrode feeding device, control cabinet and operator's panel. It is designed to operate with equal satisfaction from either Westinghouse variable voltage or constant voltage welding motor generator sets.

The growth and economy of automatic arc welding in the metal working industries has brought about a demand for an automatic welder of very compact dimensions to facilitate mounting on the welding tools.

The Weldomatic has been developed by the Westinghouse Electric and Manufacturing Company to meet these conditions. It automatically strikes and holds an arc between an electrode and the work to be welded without the aid of an operator other than to press the starting button. The feeding device is a compact design which permits its ready application to work handling tools. The drive motor is mounted in a cylindrical frame which supports the nozzle assembly. The nozzle has adjustments for being moved in two planes, and the nozzle assembly can be reversed very easily to be either a right hand or a left hand assembly.

The compact design is obtained by a new method of automatic arc control. This method permits the elimination of all clutches, relays, springs, etc.

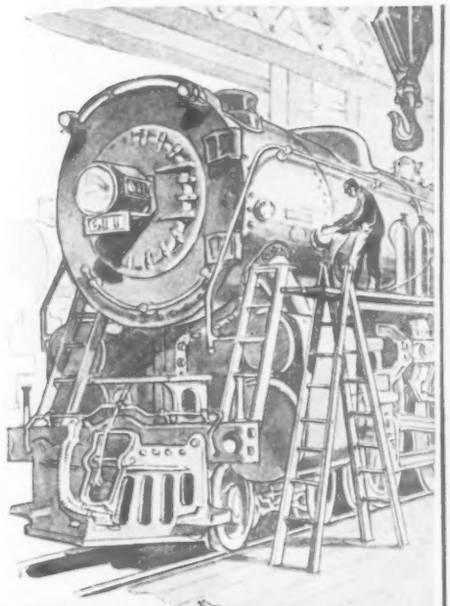


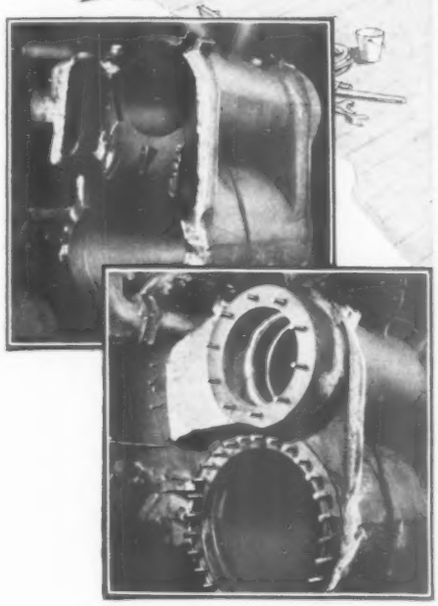
New Simplified Weldomatic Head Showing Electrode Feed Device and Cylindrical Frame Enclosing Drive Motor.

The control units are mounted in a cabinet which may be conveniently located with respect to the head and operator's panel. A small motor generator set in the cabinet automatically controls the head motor to change its speed and the direction of electrode feed as required by arc conditions. By means of this control, positive striking characteristics, unusual sensitivity of response to arc conditions, and a rate of electrode feed exactly equal to the electrode consumption is obtained. During the welding operation the control motor generator set is the only moving part in the control system.

The operator's panel has a rugged "start" and "stop" push-button station with large buttons to facilitate its operation with gloved hands. A rheostat controls the arc voltage, which is recorded on a voltmeter, over a wide range. A switch on the panel also permits the operator to reverse the direction of the head motor to retract the electrode from the work under power.

Positive feed without slippage, extreme sensitivity insuring instantaneous response to arc voltage conditions, wide range of speeds, compact mounting dimensions combined with light weight, simplicity of design, ease of adjustment, and smoothness of operation are some of the outstanding features claimed for the Weldomatic.





Top: Front end of locomotive steam chest broken away.
Bottom: New casting welded in place with Tobin Bronze

This fractured locomotive cylinder *speedily* repair welded with TOBIN BRONZE

RECENTLY a powerful railroad locomotive was damaged in such a way that the front end of the steam chest and part of the passage pipe through which it receives steam from the boiler, were broken off.

A new front end, weighing 550 lbs., was cast and welded into place with Tobin Bronze. 185 lbs. of filler rod were used in making the repair. This was done without special pre-heating, because Tobin Bronze flows freely at 1650 degrees F. The locomotive was returned to service with a minimum of time lost, and the cost of the repair showed a very satisfactory saving over the cost of replacing the entire half-saddle casting. This is a typical example of the success with which Anaconda Copper Alloy Welding Rods are being used in railway repair shops throughout the country.

The high strength and uniform composition of Anaconda Copper Alloy Welding Rods is due to the experience and technical knowledge of The American Brass Company in developing alloys suitable for all welding purposes where copper alloy rods can be used. From raw materials to finished product, the manufacture of Anaconda Welding Rods is attended with the most scrupulous care. For further information, send for Publication B-13.

There is a suitable Anaconda Filler Rod for every welding purpose. The principal Anaconda Welding Rods, with their melting points, are listed below:

for oxy-acetylene welding

Tobin Bronze*	1625°F
Manganese Bronze	1598°F
Brazing Metal	1634°F
Naval Bronze	1625°F
Electrolytic Copper	1981°F
Silicon Copper	1981°F
Phosphor Bronze	1922°F
Everdur*	1866°F

for arc welding

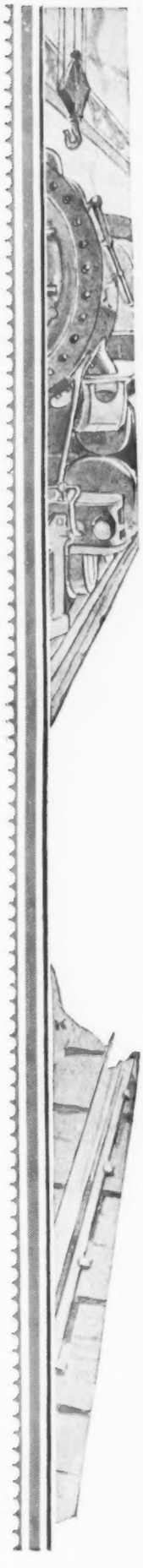
Silicon Copper	1981°F
Phosphor Bronze	1922°F
Everdur*	1866°F

*Reg. U. S. Pat. Off.

THE AMERICAN BRASS COMPANY
GENERAL OFFICES: WATERBURY, CONNECTICUT
Canadian Mill: ANACONDA AMERICAN BRASS LTD.
New Toronto, Ontario

ANACONDA
WELDING RODS

ANACONDA
from mine to consumer

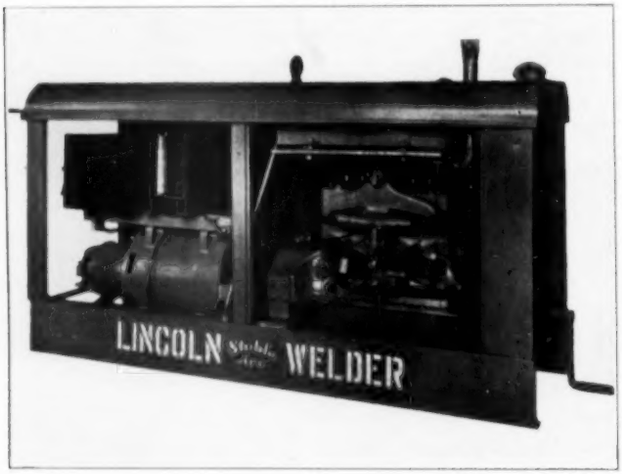


It is expected that this new Westinghouse development will be shown for the first time at the National Metal Exposition, which is to be held in Cleveland during the week of September 9th. The Weldomatic will be mounted on a pipe handling tool and exhibited in actual operation, making circumferential welds on pipe joints. A 400 ampere welding set will be used to supply the current for this demonstration.

NEW LINCOLN GAS ENGINE DRIVEN WELDER

The Lincoln Electric Company, Cleveland, Ohio, has recently introduced to the trade a new model gas engine driven welder for use where electric power is not available. The new model welder is of 200 amperes N. E. M. A. rating and is powered by a 4-cylinder Waukesha engine, operating at 1,500 R. P.M.

The latest improvements which are featured in the new improved models of Lincoln gas engine driven welders are



included in this new model. An automatic idling device is incorporated which automatically reduces the speed of the gas engine, when welding operations cease and automatically accelerates the engine to proper speed, as soon as welding is started. It is estimated that this automatic idling device will reduce fuel consumption approximately 25%, as well as considerably reducing wear in the welder which will permit longer life of the equipment.

Another feature of this new model welder is the complete protection afforded the machinery by the welded steel canopy which totally encloses the outfit.

Unified control, a feature of all new improved "Stable-Arc" Welders, is also incorporated in this new model. Operating controls are enclosed in a ventilated steel cabinet.

WELDING DEMONSTRATION TO FEATURE AMERICAN BRASS COMPANY EXHIBIT

The American Brass Company exhibit in Booth No. 235 in the welding section of the National Metal Exposition will comprise the complete line of Anaconda Copper Alloy Welding Rods, which include Tobin Bronze, Manganese Bronze, Brazing Metal, Naval Bronze, Electrolytic Copper, Silicon Copper, Phosphor Bronze and Everdur. An outstanding feature of the exhibit will be a demonstration of oxy-acetylene welding with bronze filled rods by Charles Gallo, an experienced welder and an accepted authority on bronze welding.

Other interesting features of The American Brass Company's exhibit will be a number of various types of bronze welding jobs and a display of Everdur, an Anaconda alloy of copper, silicon and manganese (hardened and strengthened copper) in the forms of sheets, wire, rods, tubes and ingots.

Mr. W. C. Swift, Service Engineer of The American Brass Company, will be in attendance.

WELDED AUTOMOBILE CHASSIS WILL BE A FEATURE OF ELKON EXHIBIT

An important part of the exhibit of Elkon, Inc., manufacturers of Elkonite, at the National Metal Exposition this month will be a complete Model "A" Ford Chassis with a cut-away section showing hundreds of resistance welds. It is stated that nearly all of these welds are made with Elkonite dies and electrodes. Another interesting feature of the exhibit will be the actual demonstration of Elkonite Tips for the Brewster Etchograph machine. In addition to the above there will be various examples of different types of resistance welding taken from actual production in plants located in various parts of the country.

GIBB WILL ANNOUNCE NEW DEVELOPMENTS

Announcement will soon be made of new developments in the line of resistance welders manufactured by the Gibb Welding Machine Company, Bay City, Michigan. It is said that some of their newer machines incorporate several principles of design and operation which have never before been applied to electric spot and seam welding. It is claimed that the perfection of these new principles makes for greater production speed, longer life of the welding dies and greater efficiency of operation. These developments are so new that complete information regarding them is not available at the present time. It is expected, however, that the company will have a complete operating display at the National Metal Exposition in Cleveland this month, where the most of these new developments will be featured.

WILL SHOW USES OF "STELLITE"

Visitors at the National Metal Exposition who are interested in metal cutting tools will find a complete demonstration of Stellited tools in the booth of the Haynes Stellite Company. It is planned to have a lathe in operation so that the cutting efficiency of these tools can be demonstrated and also to have a welding table on hand for the purpose of showing proper methods of applying Stellite to other metals.

NEW KORO LITERATURE

The Koro Corporation at Waukegan, Illinois, manufacturers of welding wire products, have recently issued a new leaflet describing the principal items in their line of wires for gas and electric welding. The lines include the KORO wire for automatic arc-welding, also Baer-coated and bronzed electrodes for welding of steel and iron. Different grades are listed according to the class of work which the wire is expected to do. Two grades of gas welding rod for mild steel welding are included. The folder is nicely printed in two colors and gives complete information regarding the range of work for each class of wire and the wires which are carried in stock.

A new item described in this folder is the Koro processed electrode. This is a mild steel electrode capable of carrying a high current and it is for use on general metallic arc welding, such as steel tank work, structural work and other production work. The features claimed for it are arc stability and good operating results in overhead and vertical welding. This wire is carried in all of the conventional stock sizes and special sizes can be furnished on order.

PHILADELPHIA, PA.
Gas and Electric Welding Wire

EDGCOMB STEEL
Distributing for
AMERICAN STEEL & WIRE CO.

NEWARK, N. J.
A Type for Every Purpose

PREMIER TESTED WELDING WIRE
Complete Stocks for Immediate Delivery

NEWS OF THE WELDING TRADE

A. G. Thorsell, formerly Pacific Coast representative of the Imperial Brass Manufacturing Company, has recently joined the sales organization of the Stoody Company and will serve the territory adjacent to Los Angeles. Mr. Thorsell brings to the Stoody Company an experience of twelve years in the oxy-acetylene industry.

It is reported that the Bain-Beaird Company, Shreveport, Louisiana, manufacturers of oxygen, have recently merged with the Air Reduction Sales Company of New York.

A new addition will be constructed soon for the plant of the American Transformer Company at 178 Emmet Street, Newark, New Jersey. The company manufactures transformers, including those for welding service. The new construction will be a two-story affair which will cost in the neighborhood of $40,000 when complete.

A. F. Keogh, president of the Sound Welding Company, New York City, was a recent visitor in Chicago, where his company is engaged in a welding contract involving repairs to a steel bridge.

The plant of the Blackwell Welding Company of Toledo, Ohio, has recently been taken over by the Boom Boiler and Welder Company of Cleveland, Ohio. It is said that the plant will be operated under the management of W. J. Heller.

J. C. Menzies, formerly of the National Welding Products Corporation of Chicago, recently left that connection to join the sales force of the Koro Corporation, Waukegan, Illinois. Mr. Menzies has represented the Koro line in the Cleveland district previously and in his new connection will cover all of the central states territory.

It is reported that the sales department of the Page Steel and Wire Company, Bridgeport, Connecticut, has been moved to Pittsburgh, where it will be located in the American Bank Building. J. J. Flaherty will be in charge of welding wire and specialties. W. T. Kyle, Sales Manager, will have offices at 230 Park Avenue, New York City.

Craftsweld Equipment Corp.
is prepared to furnish complete units with skilled operators for any
UNDER-WATER CUTTING WORK
Craftsweld Equipment Corp., 250 W. 54th St., New York

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Help Wanted—75c per line, minimum 4 line
Jobs Wanted—4 lines free.
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Counted 8 words to line. Add 6 words for keyed address.

Sales Promoter—Have had ten years in the oxy-acetylene equipment field. In that time have established two manufacturers' products in the South. Now open for a proposition. Address Box 203, care of The Welding Engineer.

Salesmen Wanted—Two experienced oxy-acetylene apparatus salesmen for the Chicago district and also two salesmen in the same line for the Philadelphia district. Preferably these men should be somewhat familiar with the territories indicated. It is essential, however, that they be thoroughly experienced in selling torches, regulators, etc. Address Box 202, care of The Welding Engineer.

Wanted—Welding Wire Sales Engineer (also other wires)—Young, energetic, knowing New York and Eastern territory. Commission against drawing account. Our employees know of this advertisement. Full particulars to Box 201, care of The Welding Engineer.

It depends on the job—

Some welders use Gloves, others prefer Mittens. Some require a heavy Glove, lined, unlined, or reinforced on the palm or fingers; others want a lightweight Glove. Whatever your job requires, we make it in leather or asbestos; also, Aprons and Sleeves.

THE OLYMPIC GLOVE CO., 611-621 Broadway, NEW YORK

TISCO

MANGANESE STEEL WELDING WIRE $\frac{1}{8}$" to $\frac{5}{16}$" dia.
STOCK SHIPMENTS

The premier rod for the repair, or building up of worn Manganese Steel Track-work and other castings requiring a hard tough surface. Manufactured by the makers of Tisco Manganese Steel; the first in America to produce this remarkable metal.

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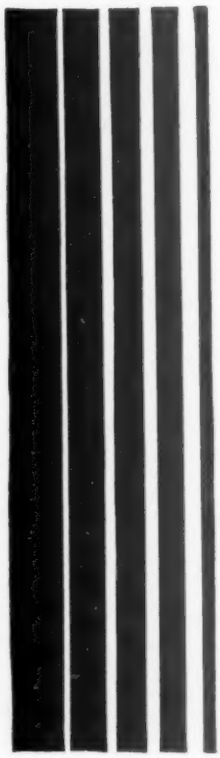
TAYLOR-WHARTON IRON & STEEL CO. HIGH BRIDGE, N. J.

Whether you use Gas or Electricity . . .

NATIONAL Welding Carbon Products are made in many different forms, for use in all welding operations, whether by gas or electricity. There are blocks, rods, paste and flour, so refractory as to stand the high temperatures encountered in working with gas. These same products are available for the electric welder, for whom we also make National Welding Electrodes in various sizes and capacities, for use in either welding or cutting.

The benefit of our accumulated experience in making welding processes more efficient is at the disposal of any welder.

Write for list of our distributors



NATIONAL CARBON COMPANY, INC.

Carbon Sales Division

Cleveland, Ohio

Unit of Union Carbide UCC *and Carbon Corporation*

Branch Sales Offices are located in

New York, N. Y. Pittsburgh, Pa. Birmingham, Ala.
Chicago, Ill. San Francisco, Cal.

NATIONAL WELDING CARBON PRODUCTS

BLOCKS
RODS
PASTE
FLOUR
ELECTRODES

ACETYLENE
OXYGEN
HYDROGEN
NITROGEN
PRIMOGAS
I.O.C. SYSTEM

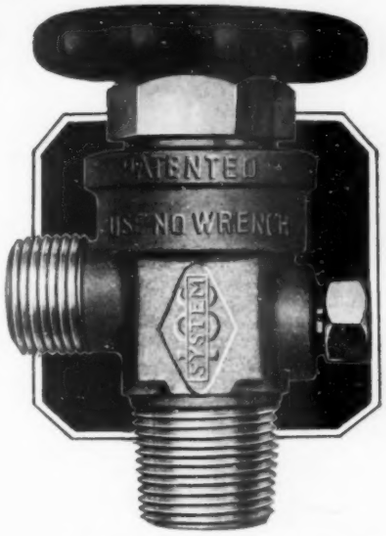
Send for this Catalog!

It describes fully our complete line of equipment and accessories for welding, cutting and other uses—everything from gloves and goggles to complete generating plants You will find this catalog of great value to you in buying to the best advantage.

"SUNRAY" WELDING FLUX

A FLUX for Welding or Brazing all Metals

Improved I. O. C. Patented Packingless Valve



Its use eliminates leaky valves. It also reduces repair and maintenance cost. Operation is easy and positive. Approved by the Underwriters Laboratories.

All our cylinders are equipped with I. O. C. Patented Packingless Valves.

INTERNATIONAL OXYGEN COMPANY

I.O.C. SYSTEM Newark, N. J. Long Island City, N. Y. Verona, Pa. Toledo, Ohio. Buffalo, N. Y. I.O.C. SYSTEM

NEW ENGLAND DIVISION — THE TARIFFVILLE OXYGEN COMPANY, TARIFFVILLE, CONN.

What...

does this word "quality" mean?

As applied to gauges, it means, "Superior in design, in workmanship and in materials used." "Superior to the common run of instruments."

As applied to National Gauges it means all of that, and more. It means that long and continuous service has proved that National Gauges fully deserve the preference which welders themselves maintain for these instruments; that the unqualified endorsement given them by the Underwriters Laboratories is genuinely deserved; and that their widespread use is founded on dependability, not merely high pressure selling effort.

Yet with this justified claim of Quality, National Gauges are not expensive, because the tremendous demands of users have made possible large volume production, with an accompanying lowering of cost of manufacture.

MotoMeter Gauge & Equipment Corp.
La Crosse, Wisconsin

Represented in Illinois, Indiana, Wisconsin, Minnesota and Missouri
by
Joseph Halla,
333 North Michigan Ave., Chicago, Ill.

MotoMeter Gauge & Equipment Corp.,
820 Tower Court, Chicago

MotoMeter Gauge & Equipment Corp.,
15 Wilbur Ave., Long Island City, N. Y.

Experience dictated these opinions of the Owen Induction Arc Welder

We are happy to inform you that we have found our welder to be all that you advertise it to be. To make a long story short, "We have no complaint to make, whatsoever, in regard to the welder." This after all is the best recommendation any one could give. We might add, however, for the benefit of those who do not know, that we have put this welder to the test and it has not been found wanting.

We certainly prefer an Owen welder to any other welder we have yet seen.

Yours very truly,
EL DORADO BOILER & WELDING, WKS., El Dorado, Ark.

Referring to your letter of the 20th relative to 200 ampere welding machine purchased from the Smith Welding Equipment Eastern Corp. of Philadelphia, would advise that this machine is proving very satisfactory. There are jobs that we can do with it that were not possible with the acetylene.

Yours very truly,
HERTZLER & ZOOK CO.,
Belleville, Penna.

This is to advise that I have had one of your A.C. Induction Arc Welding Machines in service for the past two years, and glad to say that it has been entirely satisfactory in every respect. The cost of operation is very little in comparison with other methods of welding, and so far as "up keep" is concerned, we don't see any reason why it should every amount to anything at all.

We find the machine ideal for our purpose, and have accomplished some wonderful jobs welding cracked cylinder blocks, holes in crankcases, and various other parts on automobiles and trucks. As a large part of our business is cylinder grinding and motor rebuilding, we have found the score filling attachment of particular value on many jobs, and everything considered, would not be without the machine in our shop for several times the price paid for it.

To anyone in the market for an electric welding machine for general purpose work we can recommend the OWEN in the highest terms.

Yours very truly,
F. J. WALKER,
Bristol, Va.

Replying to your letter of Sept. 29th in regard to Owen Electric Welder we are pleased to say that this machine is giving very satisfactory results since your Mr. F. L. Bunker straightened us out. He "knows his stuff."

As this machine is hooked up to our shop power line we are not in position to say just how much current it uses, but our bill for current has increased very little since we installed this welder.

We can cheerfully recommend this machine for economy and general satisfaction all around.

Yours very truly,
RIVERSIDE IRON WORKS,
New Bern, N. C.

THIS IS THE OWEN ARC WELDER

The exclusive Owen principle of construction is responsible for the ecomomies and the satisfaction evidenced in these letters from our customers. Send for complete literature.

We acknowledge receipt of your recent letter, regarding the OWEN Welder, which we purchased from you, and would say that we are obtaining very good results. In fact, it is most successful in welding steel and cast iron, both light and heavy. In fact, the results obtained are far better than we had anticipated.

We do not hesitate to recommend this OWEN Welding Machine to anyone that may be interested in a welding outfit.

Yours very truly,
GIBSON MANUFACTURING CO.
Concord, N. C.

In reply to your letter of the 15th inst. wish to state that we are very much pleased with the welder you sent us nearly a year ago.

When first installed we were using city current at the rate of 4c per K. W. with a $3.00 per month minimum, while running on this rate we found that we only one month ran over our minimum, we asked the city to be put on the 8c rate and our highest month on this rate has been $3.50.

We have done all kinds of welding casting, steel, and malleable iron and have had splendid success with all, and are pleased to recommend your welder to any one in need of an Electric Welder.

Yours very truly,
BLADHOLM BROS.
Marshall, Minn.

As to the welder, I can say that it has been a big success with me. The cost of operation has been so cheap. Shortly after I installed it in my shop I built a radiator for a large tractor. There were 831 welds on it.

The Owen is a money maker for any shop. This radiator I built would have been nearly impossible with Acetylene, as it would have been warped and pulled out of shape, but with the Owen we had no trouble with warping.

We have had fine success on Cast Iron, Malleable Iron, and Steel. If I was going to buy another Arc Welder, it would be an Owen Welder.

I have a good rate, only pay for what I use and everything is hitched to the same meter. Just got my bill for this month, $2.80, and have had lots of work.

If this letter will be of any benefit to you, use it in any way you want to.

Welding is getting to a place where a shop must turn out good work, and any welder can not go wrong by putting in an Owen Welder, for they will do the work.

Yours respectfully,
CLASS "A" WELDING WKS.,
Caldwell, Idaho.

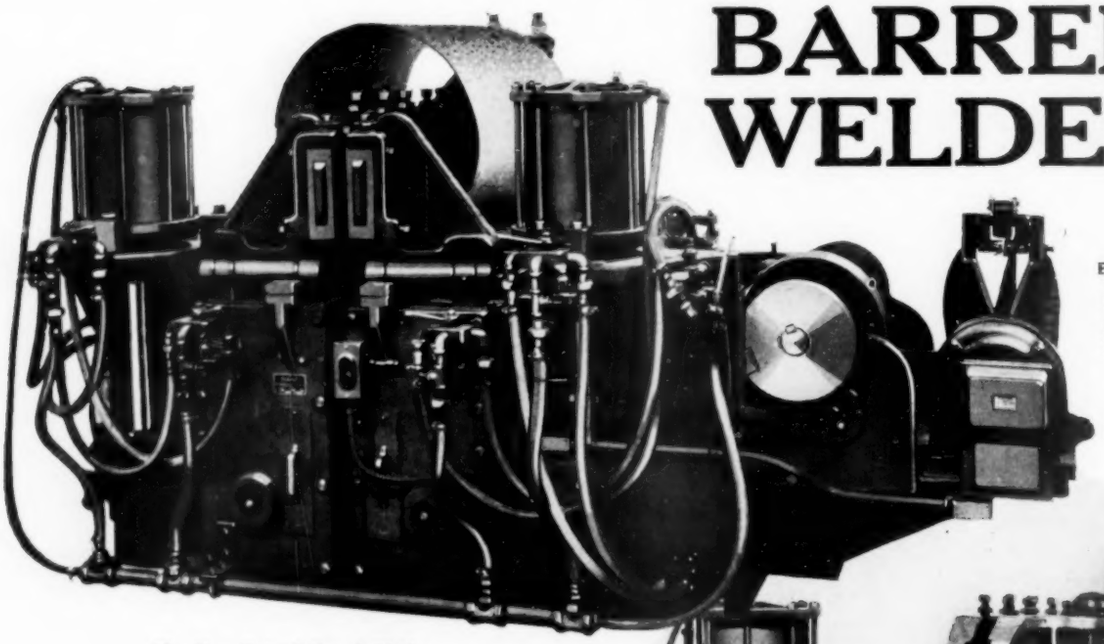
Address all communications to

OWEN ELECTRIC MANUFACTURING COMPANY

Fayetteville **North Carolina**

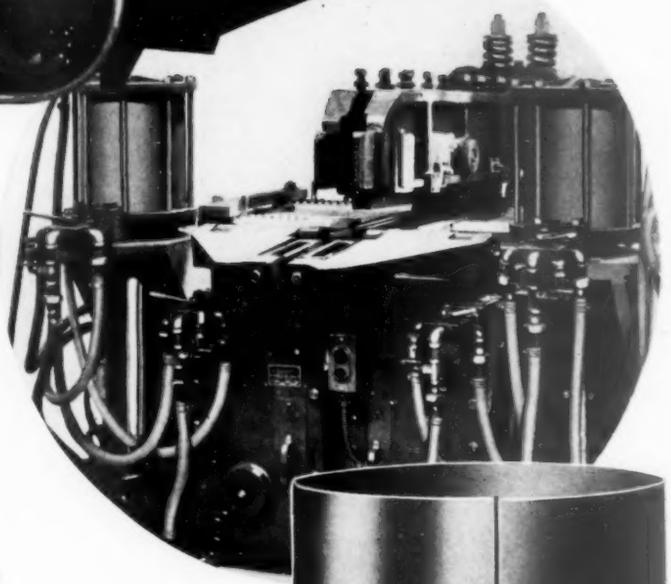
(Exclusive Manufacturers of the Owen Patented Arc Welding Equipment)

The New FEDERAL BARREL WELDER



BELOW.
The New Federal Barrel Welder with the clamping arm down, ready for setting.

The New Federal Barrel Welder in operation.



For Any Gauge Metal Any Size Barrel

An efficient barrel and tank welder capable of welding a seam 40″ long in 12 gauge metal and by means of a regulating coil to weld the same length seam in 24 or any intermediate gauge with equal efficiency.

Capacity for barrels or tanks from a minimum diameter of 14½″ to any size and the ability to weld from 60 to 100 containers per hour makes this new Federal Welder a valuable piece of production equipment in an important field.

Send for further details on efficient barrel and tank welding by this new Federal Welder.

An 18 gauge, 55 gallon barrel Federal Welder on this New Machine.

Visit the Federal Exhibit at Booth 226 and 228 — National Metal Exposition—Cleveland.

Federal BUTT SPOT SEAM Welders

FEDERAL MACHINE & WELDER CO. Dana Avenue, Warren, Ohio, U. S. A.

Branch Offices In All Principal Cities

Federal Machine & Welder Co.

Buffalo—1116 Genesee Bldg.
Chicago—15 S. Clinton St.
Cleveland—1053 Leader News Bldg.
Detroit—914 Fisher Bldg.
Ft. Worth—Big Three Welding & Equipment Co.
Los Angeles—Smith Booth Usher Co.
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WELDIT
GASAVERS & TORCHES CUT COSTS
WELDIT ACETYLENE CO.
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DETROIT, MICH., U.S.A.
Manufacturers of a complete line of Welding and Cutting Apparatus

DON'T STRIKE A MATCH

SHOOT-A-LITE

See the safe distance of hand from flame

SAFE!

SURE!!

STRONG!!!

The finest torch lighting device made. Try it.

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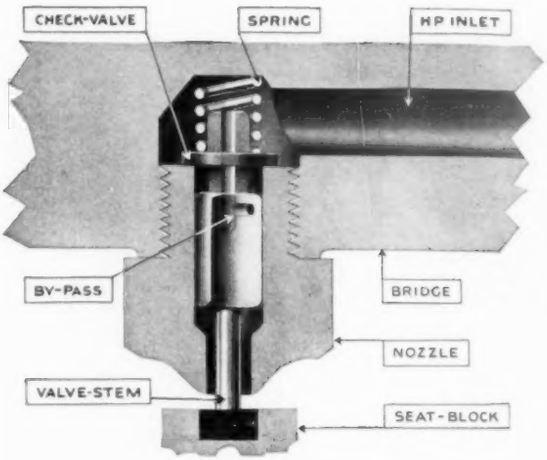
118 East 28th Street, NEW YORK, N. Y.
Order from your jobber

Positive Protection Against Battered Seats

A new feature of the famous

Meco

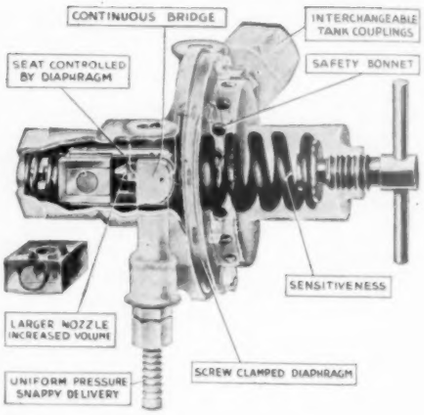
MULTI-SEAT
REGULATORS



Our new semi-automatic check valve, illustrated at the right, is an extremely simple device. It consists of a check valve located inside the bore of the high pressure inlet nozzle, and seating on the rear end of the nozzle. The check valve itself is provided with a small by-pass.

Whenever the adjusting screw is not released the valve is always closed. If, under these conditions, gas under high pressure is admitted through the inlet, it starts to escape slowly through the by-pass to the low pressure side of the regulator until the pressure on that side builds up sufficiently to overcome the pressure exerted by the adjusting screw, through the compression spring, on the diaphragm. When this occurs, the seat immediately approaches the nozzle and valve stem, forcing the valve off its seat, in which position the valve continues to function.

Thus the sledge-hammer like blow of the seat against the nozzle, which usually occurs when the high pressure valve is opened with the adjusting screw not released, is eliminated, and utmost safety is provided. This valve is positive in operation. It functions by contact with the seat. Should this contact cease, the valve closes and prevents the high pressure gas flowing through the regulator.



The primary purpose of this new device is to eliminate the rupture of seats and other mishaps. However, it has many additional favorable features. For example, the presence of the stem in the nozzle increases the velocity of the high pressure gas at this point and causes the seat to function with a greater opening. Therefore, any snow or ice formed through the refrigerating effect of expansion is carried beyond the point of the nozzle, and no clogging effect is experienced.

All MECO Multi-Seat High Pressure regulators are equipped with the new semi-automatic check valve. It is an exclusive MECO feature. It greatly improves the functioning of the high pressure regulator, without producing any undesirable features.

Dealers, located in principal cities, will be glad to demonstrate for your benefit.

MODERN ENGINEERING CO.
3411 Pine Blvd. St. Louis, Mo.

Sales and Service in All Parts of the United States
Write for Address of Our Nearest Representative

TRADITION PROGRESS

"Here, Lad—

I have held up buying an arc welder, not because I'm against arc welding.

I've been trying to discover a machine with the *whole assemblage* of features necessary to make us some money.

From your report of six months ago, I'm convinced that the Lincoln 'Stable-Arc' welder has it."

The new improved Lincoln "Stable-Arc" Welder

"Yes, Pop—

but you mean HAD it.

Today the *improved* model also has IT. Look at the photo.

That's the way a welder *ought* to be built, with UNIFIED CENTRALIZED and SIMPLIFIED control . . . everything mounted together . . . everything under cover . . . everything right up within easy reach.

Then, too, it has the automatic starter combined as part of this centralized control, making it much more fool-proof. The unified control simplifies operation, and mounting control on top shortens the welder length. It's just like adding more floor space for nothing. So, if you're convinced that the old Lincoln welder would make us some money . . . then the new one ought to make us rich."

The Lincoln Electric Company
Dept. No. 27-9, Cleveland, Ohio

W-109

LINCOLN "Stable-Arc" WELDER

Now — you can get coated electrodes of the famous PAGE *quality*

Just ask for

NATIONAL

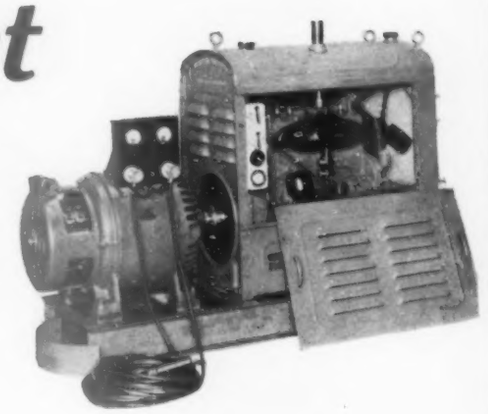
FLUX COATED ELECTRODES

THE National Welding Products Corporation specialize in the production of coated electrodes in which the wire is of highest quality and absolutely uniform. The wire materials made by the Page Steel and Wire Company are used exclusively. This new product has long been wanted by users of flux coated electrodes. Order through your nearest PAGE distributor.

NATIONAL WELDING PRODUCTS CORP.
4400 Addison St.
CHICAGO, ILL.

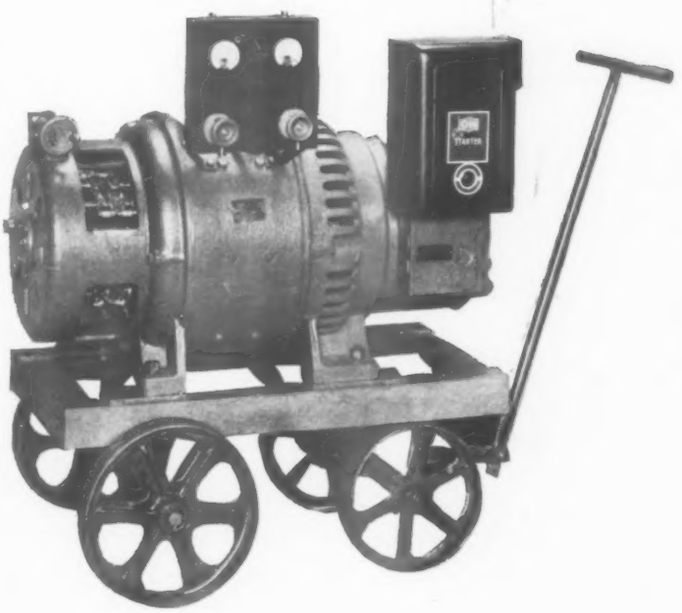
The Real Test

of ANY Welding Machine



is the quality of the welds it makes. Regardless of the skill of the operator, high weld quality is impossible unless the generator is so designed electrically that sound welds are produced as a matter of course. With the

HANSEN ARC WELDER



the factor of the operator's skill is brought to a minimum—a fact repeatedly proven by results obtained with the Hansen by amateurs in the welding art. And for skilled welders, the Hansen makes their work easier, faster and better.

With no external stabilizer, no exciter, and no field rheostat, the Hansen is simplicity itself. No voltage adjustment is necessary, voltage being regulated automatically. There is no other welder on the market as simple and as easy to operate as the Hansen.

The Hansen Welder is made for belt, motor or gas engine drive. The last two can be furnished in either the stationary or portable type.

The HANSEN'S popularity is due to these distinctive Features:

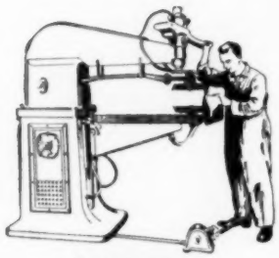
No external Stabilizer
No Exciter
Extreme Simplicity
Deep Penetration
Great Overload Capacity
Wide Range
Minimum of Space and Weight
Long Life

NORTHWESTERN MFG. CO.
Clinton and Madison Sts., MILWAUKEE, WIS.

No matter what kind of welding you do--

OXY-ACETYLENE

ELECTRIC ARC



RESISTANCE

THERMIT

YOU NEED

The Welding Encyclopedia

New Sixth Edition

It describes in detail the theory and practice of every welding process.

It tells how to weld every weldable metal by each of the welding processes.

It gives detailed instructions for handling the important welding jobs, such as boiler welding, sheet metal welding, tank welding, pipe welding, etc.

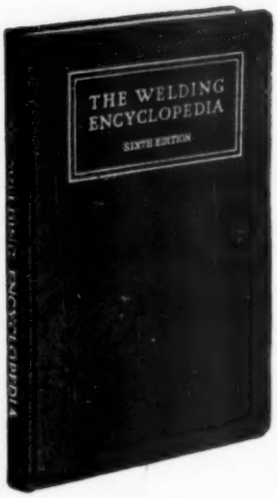
It tells how to prepare parts for welding.

It tells how to install and care for welding equipment.

It explains the meaning of all words and terms found in welding literature.

It tells where to buy standard makes of welding apparatus and supplies.

The Sixth Edition contains much new and valuable data on Bronze Welding, Structural Welding, Welding of Stainless Steels, Resistance and Thermit Welding, Rail Bonding, and Design Data for Production Welding.



496 Pages
645 Illustrations
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Contents

1. Illustrated encyclopedia covering all words, terms, and trade names used in welding.
2. Oxy-Acetylene Welding.—Aluminum, Steel, Cast Iron, Brass, Bronze. (Full instructions for welding each of these metals.)
3. Electric Arc Welding.—Complete instructions for welding all metals, studding, cutting, etc.
4. Electric Resistance Welding.—Includes Butt Welding, Line Welding, Percussion Welding and Spot Welding.
5. Thermit Welding.—The most complete treatise on this process ever published.
6. Cutting Metals.—Treatises on both gas and arc cutting. Includes cast iron cutting and automatic cutting.
7. Boiler Welding.—Gas and Electric Processes. Suggestions, procedure, and standards of practice.
8. Complete chapters on Pipe Welding, Rail Joint Welding and Tank Welding, explaining procedure in detail.
9. Rules and Regulations.—What can be welded and what cannot be welded. Rules also govern the installation and operation of equipment.
10. Complete instruction courses in Electric Arc Welding and Oxy-Acetylene Welding. Lessons, Exercises, Reference Readings, Examinations.
11. Charts and Tables.—A fund of welding information at a glance. Includes color chart showing colors at various temperatures, and color chart showing proper adjustment of oxy-acetylene welding flame.
12. Condensed Catalogs.—Up-to-date information about the leading makes of welding apparatus and supplies. The Buyers' Index is a convenient and reliable guide to the man who purchases or recommends welding apparatus.

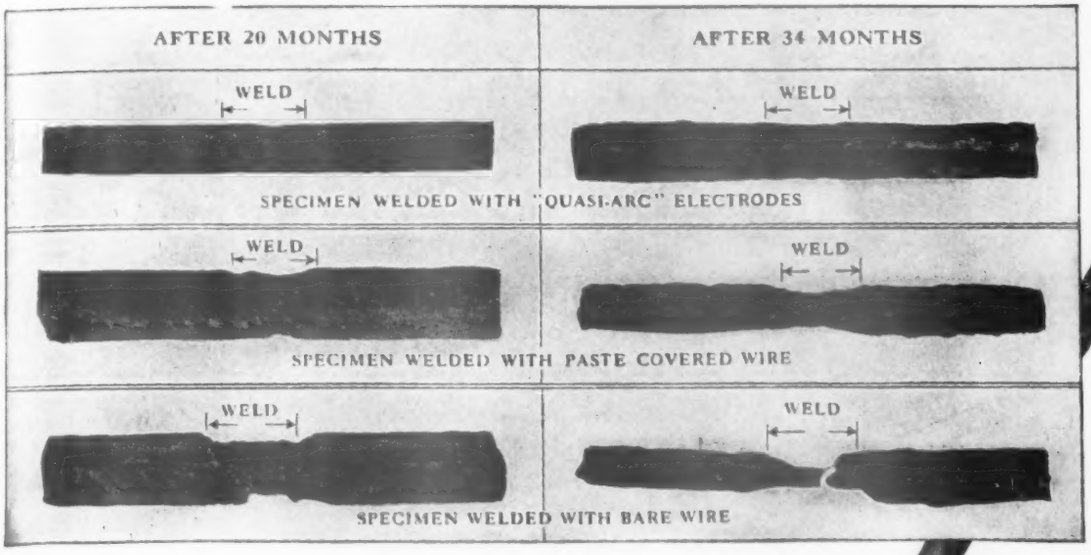
THE WELDING ENGINEER PUBLISHING CO.,
608 S. DEARBORN ST., CHICAGO, ILL.

Please send me a copy of The Welding Encyclopedia, Sixth Edition, for which find enclosed five dollars. I understand that I may keep it for five days for examination and if it is not satisfactory I may return it and you will refund the purchase price.

Name .....

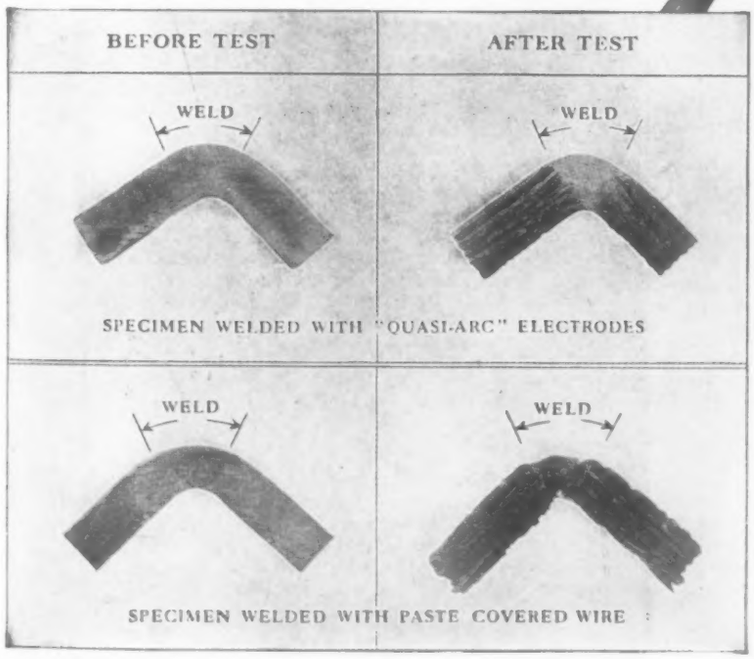
Street .....

Postoffice .....



Above, the results of a corrosion test extending over a period of nearly three years. A special apparatus, which plunged the specimens into sea water 10,000 times a month, was used for this test . . . Below, another test which shows that the Quasi-Arc weld offers far greater resistance to corrosion than the plate metal. Illustrations of other corrosion tests, including micro-photographs, will be mailed on request.

Quasi-Arc



Specially Covered

Welding Rods

RESIST CORROSION

If resistance to corrosion is an important factor in your work, study the accompanying pictures carefully. If you are also interested in economy, strength of weld, and in reducing the human element in welding, write us for detailed information about these features of Quasi-Arc Electrodes.

QUASI-ARC INCORPORATED

11 West 42nd Street, New York

CLEVELAND CHICAGO DALLAS LOS ANGELES

THE ADVANTAGES OF
THE ROUND FILE "IMPROVED" LIGHTER
Over the "Popular" or Any Other Round-File Lighter

1. The new renewal arm of the Round File Improved Lighter has a double grasp on the renewal, thereby holding the renewal more rigidly and securely, and, by preventing wabbling, helps to prevent the spark metal from snapping out of its socket.

2. The distance from the file to the angle of lateral motion is shorter, making the leverage shorter, so that it requires less effort to push the renewal across the file and less strain on the joint between the spark metal and its socket.

3. The two points mentioned above allow with safety the use of a longer piece of spark metal. The new IMPROVED Lighter has been provided with a spark metal that is approximately 30% longer than the spark metal used in the POPULAR Lighter, giving approximately 40% more ignitions per renewal, or approximately 5600 ignitions per renewal on the Round File IMPROVED Lighter as against 4000 on the Round File POPULAR Lighter. No more of the renewal has to be buried inside the socket on the longer piece of spark metal than on the shorter piece. This gives the IMPROVED Lighter a larger percentage of economy in the use of spark metal.

4. The new style of Renewal, not having any thread, will do away with the stripping of threads, which sometimes makes it difficult or impossible to put an additional Renewal on the Lighter.

5. The new Renewal also will permit the use later on of a more brittle metal for the bushing holding the renewal, for instance, a magnesium renewal bushing running the full length of the spark metal. Magnesium, being brittle, can be filed off about as readily as the spark metal itself without making the file hang as the brass bushing does, and therefore can be used the full length, thereby preserving the spark metal from oxidizing on its side, and thereby preserving the renewal almost indefinitely when not in use, and also enabling the renewal to be used clear down beyond the point where the bushing and the spark metal meet, this part of the spark metal at the present time having to be thrown away because the brass bushing hangs the file.

6. The plating of the Round File Improved Lighter is cadmium, which is rust-proof, while nickel or tin (the latter being what is generally used on cheap lighters) are not rust-proof at all. Points of the teeth rusting off make the file dull.

7. The Round File Improved Lighter has a double bearing for the forefinger of the right hand, making control of the Lighter more certain. The wires on the arm, which hold the Renewal, are so placed in relation to each other as to force a correct course of the renewal across the file, thereby taking up the inaccuracy of the human hand, some hands being disposed to push the renewal away from the file, and some too much into the file, in using the Lighter.

8. The wire arms of the new Lighter are of slightly smaller diameter than the POPULAR Lighter, allowing an easier and quicker stroke.

9. The IMPROVED Lighter has a hood, which holds a pocket of gas down to the point of ignition, the wings of the hood being parallel to the bottom of the file. At the same time, this new hood, and the position of its wings, provide a raceway for the renewal to travel in, across the file, keeping the arms of the Lighter from getting out of correct alignment. On the Round File Popular frequently the renewal arm would push the renewal beyond the file or not as far as the file wearing off one corner of the renewal and interfering with the efficiency of its work.

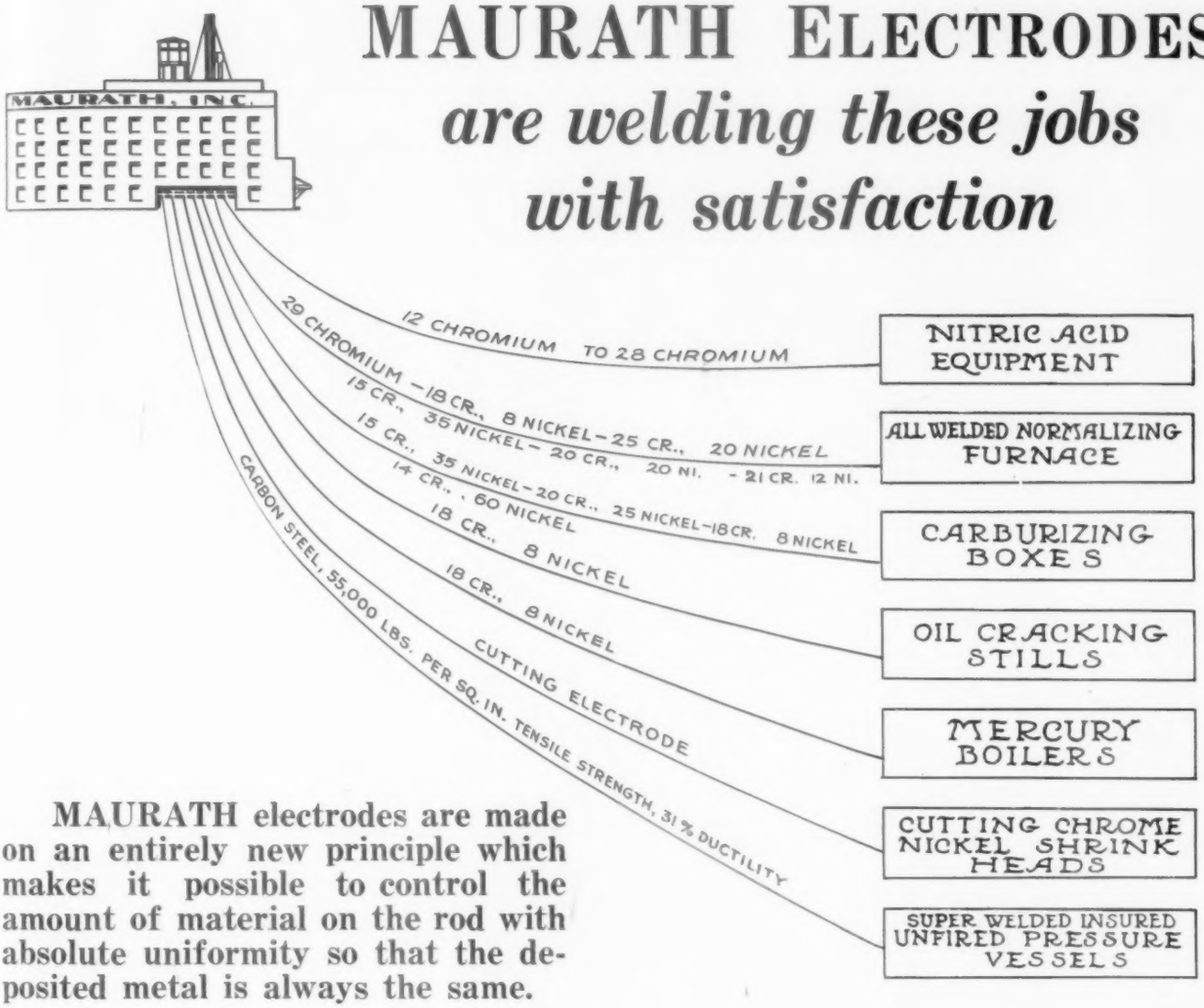
10. The hood of the new Lighter is also easily disassembled. As there is getting to be a market for files and other parts as well as for renewals, this allows shop men to reassemble them more easily than when they have to use pliers to bend a piece of steel, sometimes breaking it off.

11. An improvement not yet completely worked out in practice, though worked out in theory and already demonstrated that it can be done, is a means of automatically turning the file so that a new surface is always present at every ignition, the file being turned very slightly every time the Renewal travels across the file.

SAFETY GAS LIGHTER CO.

56 Sanderson Avenue, LYNN, MASS., U. S. A.

MAURATH ELECTRODES *are welding these jobs with satisfaction*


MAURATH, INC.
12 CHROMIUM TO 28 CHROMIUM
NITRIC ACID EQUIPMENT
29 CHROMIUM – 18 CR., 8 NICKEL – 25 CR., 20 NICKEL
15 CR., 35 NICKEL – 20 CR., 20 NI. – 21 CR. 12 NI.
ALL WELDED NORMALIZING FURNACE
15 CR., 35 NICKEL – 20 CR., 25 NICKEL – 18 CR. 8 NICKEL
14 CR., 60 NICKEL
CARBURIZING BOXES
18 CR., 8 NICKEL
OIL CRACKING STILLS
18 CR., 8 NICKEL
CUTTING ELECTRODE
MERCURY BOILERS
CUTTING CHROME NICKEL SHRINK HEADS
CARBON STEEL, 55,000 LBS. PER SQ. IN. TENSILE STRENGTH, 31% DUCTILITY
SUPER WELDED INSURED UNFIRED PRESSURE VESSELS

MAURATH electrodes are made on an entirely new principle which makes it possible to control the amount of material on the rod with absolute uniformity so that the deposited metal is always the same.

THE above diagram shows the kind of equipment and a wide range of corrosion resisting and heat resisting alloys which are being successfully welded by Maurath electrodes. If you have encountered problems in welding any of these articles we will be glad to give you the benefit of our experience.

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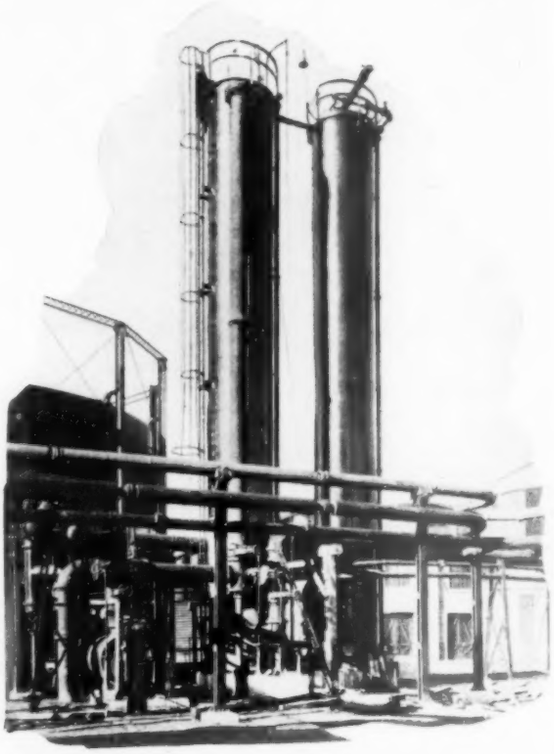

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Page Welding Wire and Electrodes are made in eight different grades, each held to exact analysis, carefully processed to assure uniform welding characteristics. Every lot is flame-tested, in addition—a shop test is made by a practical welder, to demonstrate performance "on the job."

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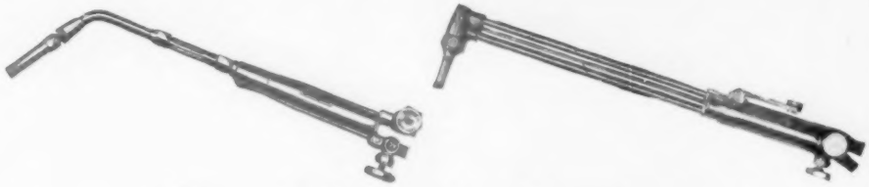
PAGE-ARMCO PROCESSED

Flame-Tested *Shop-Tested*

Welding Wire *and* Electrodes



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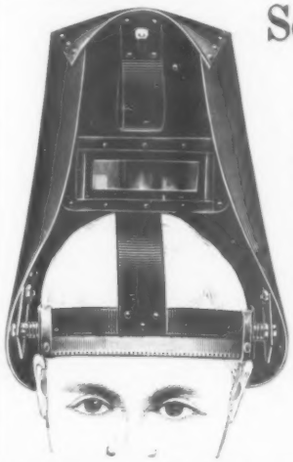

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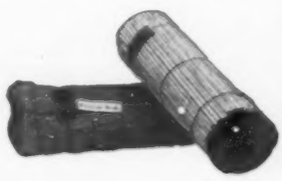

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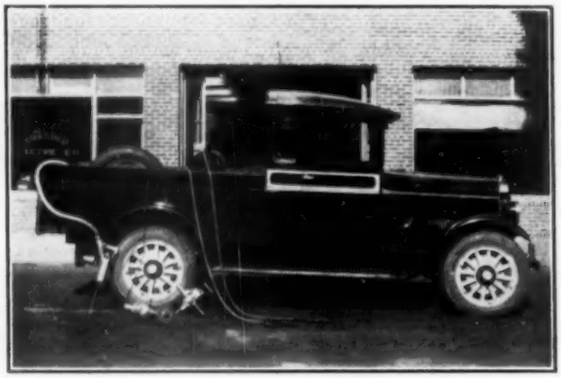

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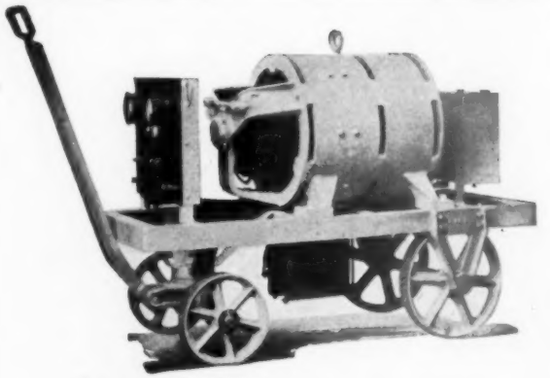

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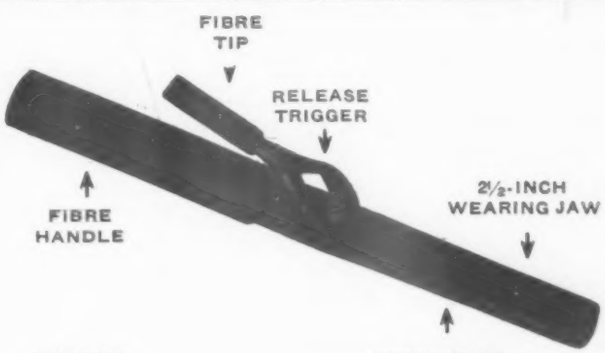

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METALLIC

ELECTRODE HOLDER

Most Simple—Most Efficient—Metallic Electrode Holder Yet Developed.

There are no springs to lose tension for the grip is positive through both jaws. Careful construction has reduced heating to a minimum, while the operator is at the same time fully protected from shocks. It is simple to quickly insert and release the electrodes, which can be used with very small amount of waste. Its construction permits the removal or replacement of the holder cable with only the aid of a screw driver—it is not necessary to use soldering. All of these exclusive features make the Almanc Metallic Electrode Holder a wise buy. *Distributors Wanted*

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Welders

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☐ Spot ☐ Acetylene
☐ Electric ☐ Flue
☐ Welding Rod ☐ Accessories

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OXY-ACETYLENE
WELDING AND CUTTING EQUIPMENT

There is an Imperial outfit for every welding and cutting job—from small, medium and large size torches to complete plants for factories, repair shops, etc. And Imperial equipment has gained highest endorsement wherever it has been used. Years of practical experience on the part of Imperial Oxy-Acetylene engineers are complete assurance of the entire practicability of all Imperial operating features.

THE IMPERIAL BRASS MANUFACTURING CO.
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KEROSENE PREHEATORS **TORIT** ACETYLENE GENERATORS

For Good and Economical Welding

Use the Torit Generator and Preheater

MADE RIGHT—PRICED RIGHT
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ST. PAUL WELDING & MFG. CO.
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FLEXIBLE SHAFT GRINDERS
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We build many Types and Sizes from 1/10 to 2 H. P. Thousands in use.

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"ANTI-BORAX"
Oxy-Acetylene Fluxes
are made for every metal and have EXCEPTIONAL merit.

BRAZ-CAST FLUX
For bronze welding of Cast Iron.

We also make the popular "E-Z" Welding Compound for forge welding.
Samples of any upon request.

Anti-Borax Compound Co. Ft. Wayne, Ind.

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Produces Tough, Sound Welds with a minimum of labor, time and expense.
Uniformly good results have been secured by its use throughout the past fifteen years.
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240 POINIER STREET, NEWARK, N. J.

There's No Waste Motion Here

YOU can undoubtedly reach a large number of good firms through an advertising campaign, which is concentrated in papers reaching selected industries, and reach along with them thousands of readers who are not and never will be concerned with welding—that's waste. You pay a needlessly high price for the interest that's there, and you make a decidedly less effective impression on that interest than if you used a less expensive campaign in **The Welding Engineer**, which reaches the concentrated interest of the country. In these pages you talk to the **right man**, in the **right plant**, at the **right time**. That's efficiency.

The Welding Engineer 608 S. Dearborn St., Chicago

WILLSON

Goggles - Helmets - Handshields

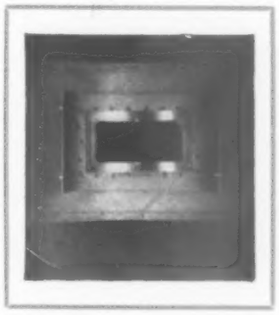
for welding

Style L60 Welding Goggles

An anatomically shaped welding goggle with indirect ventilators and Willson Weld glass with cover glass. Parts easily replaced. Price $2.50 each.

Electric Welding Helmet, Style No. 131

Made of strong vulcanized, black fibre. Adjustable, comfortable head-gear. Willson Weld glass with cover glass. Price $11.80 each.



Special Eye Shield used in Willson Helmet and Handshield

Fits closely to the face protecting him from reflection and flashes. The shield is easily detachable.

Electric Welding Handshield No. 2

Made of strong, vulcanized, black fibre. Willson Weld glass with cover glass. Lens retainer simple and effective. Price $9.15 each.

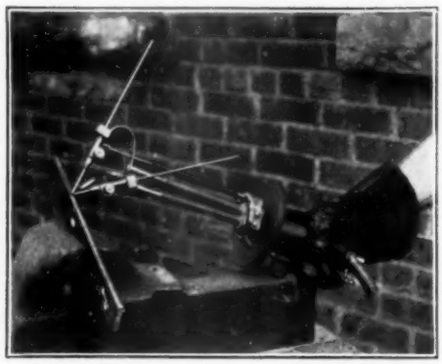
For complete catalog send to

WILLSON PRODUCTS, INCORPORATED

READING, PA., U. S. A.

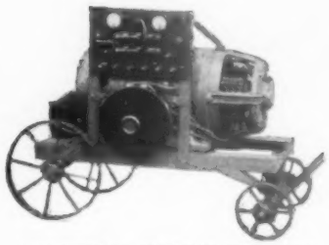
Every Known Type of Arc Welding Machine

The Alternarc, Model A-150, A. C. welder, will operate on any power supply. Low cost, low upkeep, long life.



The Hydrogen Flame Welder can be attached to any Alternarc machine. Has a large number of industrial uses. Write for details.

Durability,
Portability,
Flexibility.



The Dualarc, Model M-150, motor-generator welder. Supplies A.C. or D.C. current. Also gas-engine-driven.

We are in a position to recommend the best type of arc welder for your requirements. This statement is based on the fact that we are the only firm in the world that manufactures all of the various types.

A. C. Cutting Machines effect great savings in cutting steel, cast or malleable iron and alloy steel.

"Dualarc Gas Engine Set with air compressor and separate transformer for lights, drills, grinders, etc."

The double-carbon electrode handle has special uses in carbon arc welding.

COMPARISON OF FUSION WELDING METHODS

	DIRECT CURRENT ARC		ALTERNATING CURRENT ARC					
	Metallic	Carbon	Metallic	Single Carbon	Double Carbon	Hydrogen	Gas Welding	Thermit
Steel	Good, except below 16 ga.	Good, similar to gas method	Good, except for thin work	not good	good especially thin work	good especially	good	good
Cast Iron	Good properly prepared	good preheated	better	poor	good preheated	edgewise good	good	poor
Stainless steel	fair	poor	fair	poor	fair	best	preheated good	N-G fair
Monel & Nickel	fair	poor	fair	poor	fair	fair	fair	fair
Copper & Alloys	fair	better	poor	fair	better	good	good	poor
Alloy Steels	fair	better	fair	poor	good	best	good	good
Speed Labor	good	better	best	poor	fair	slow	slow	slow
Operating Cost	cheap	cheaper	cheapest	cheap	cheap	fair	costly	costly
Installation Cost	fair	costly	cheapest	cheap	fair	fair	low	none
First Cost	fair	costly	cheapest	cheap	cheaper	fair	low	high
Portability	fair	not generally	most portable	not generally	fair	most portable	fair	fair
Special Field	thin work & fussy work	edgewise & foundry work	Rapid iron & steel product	thin edgewise	edgewise thick or thin	alloy jobs especially preheated	good preheated	repeat work

ELECTRIC ARC CUTTING & WELDING CO.

152-153 Jelliff Ave. Newark, New Jersey